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EVOLUTION OF FLATWARE BLANKS

By C. W. Cook.

So much has been said about the methods of making flatware that it seems almost superfluous to add anything more, but in these days of sharp competition in the business it may be of interest to the readers of The Metal Industry to know how the manufacturer has been obliged to invent new methods whereby he can save all the base metal he possibly can, and produce goods of standard finished weights. In the olden days, when plated ware was made by hand, or at best with very crude machinery and tools, and there were very few men in the business, there was really no call to consider the number of pounds or ounces of metal used in making a dozen spoons or forks. But today, with large plants and millions of dollars invested, it is another proposition altogether. The man of today must avail himself of every known method to keep pace with his neighbor in this line of work. If it is found that one manufacturer can produce a gross of spoons or forks from say thirty (30) pounds of base metal, his neighbors lose no time in getting their inventors at work and, if necessary, spending thousands of dollars to beat even by a few ounces his competitor, who had produced his gross by using thirty pounds of metal. The high cost of metals and low prices of finished goods force all in the business to a very rapid pace and calls for all the genius and skill that can be procured to keep up to date in the manufacture of flatware. The large demand for nearly all metals is to a certain extent responsible for the advanced prices in flatware base metal. The low prices of finished goods are largely due to the manufacturer himself, by selling his product low enough to get his competitor's business, many times at the sacrifice of all margin and quality of the product.

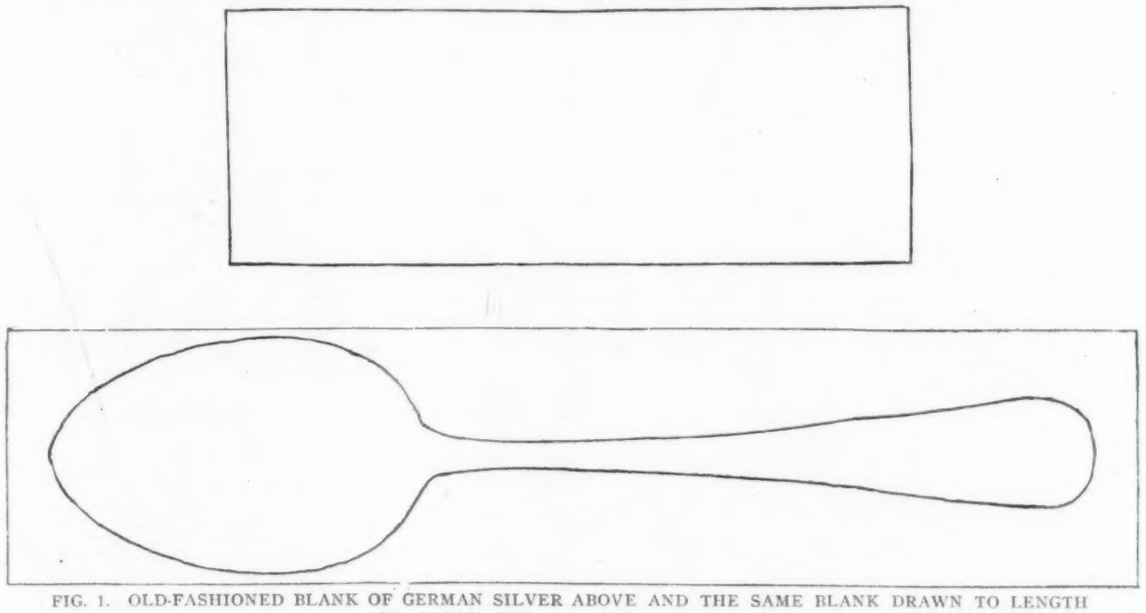


FIG. 1. OLD-FASHIONED BLANK OF GERMAN SILVER ABOVE AND THE SAME BLANK DRAWN TO LENGTH AND SPOON CUT OUT IN LOWER FIGURE.

In the earlier days of the pioneers, when such men as H. C. Wilcox, Robert Wallace, Samuel Simpson and J. C. Lewis, were in the trade, their maxim was quality of goods first, and doing unto their neighbors as they would wish to be done by. In these latter days of hustle and competition the methods of these old gentlemen have been in many cases thrown to the winds, and today the slogan seems to be quantity first, quality second, so long as the goods will pass muster with the buyers, and the good, old way of doing as one would wish to be done by has been changed and stands many time in doing your neighbor before he gets a chance to do you; and, hence, owing to the sharp practices and methods in vogue today, the country is flooded with a cheap product in quality, make and finish, which the old pioneers in the business would be ashamed to stamp with their names.

The writer has taken three sheets of illustrations of blanks to show the difference in shapes and weights to produce a spoon from the old method to the new. Fig.

1 illustrates the old-fashioned method with a piece of metal 5 inches long, 1⅞ inches wide. This blank as shown would weigh approximately sixty (60) pounds to make a finished gross of spoons. The sketch shows the large amount of waste metal in this form of blank. The spoon from above blank was made without the blank being put through any other process except grading to required thickness.

In Fig. 2 we have another and very much lighter

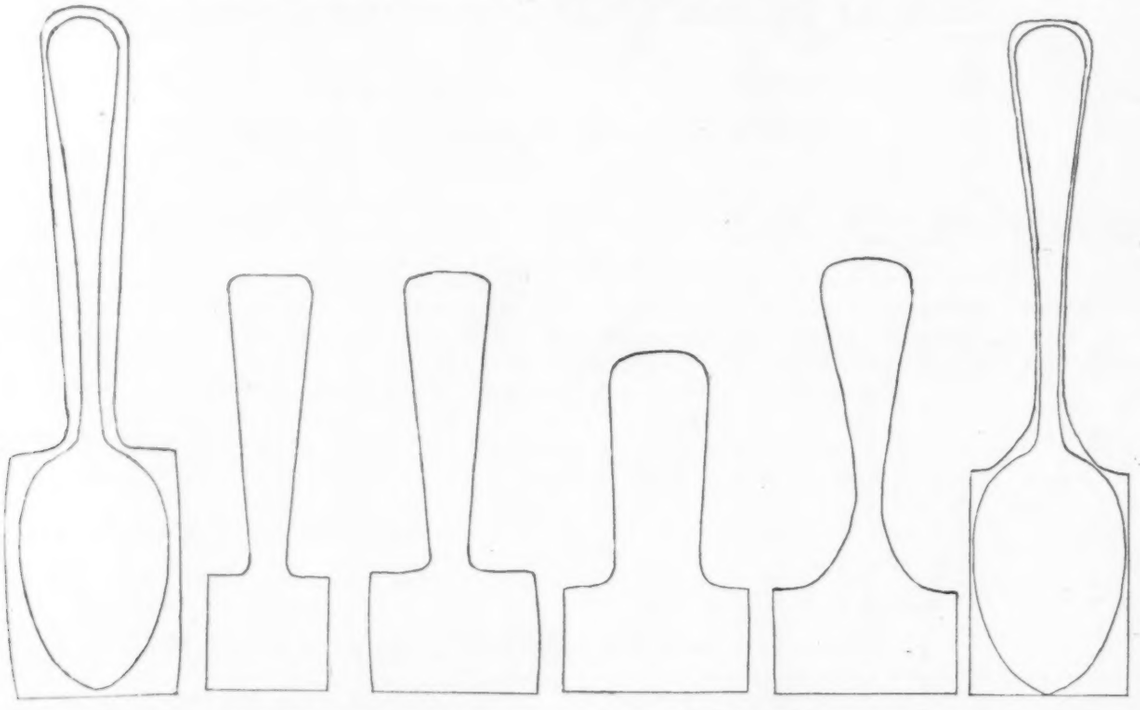


FIG. 2. MODERN FORM OF LIGHTER BLANKS SHOWING RESULTS OF "CROSS ROLLING" TO PRODUCE SPOONS WITH MINIMUM OF SCRAP.

form of blank. This blank would weigh approximately twenty-nine (29) pounds to make a finished gross of spoons, and cuts down over one-half the weight from the blank in Fig. 1. This form of blank requires more operations to make the spoon; it is cut out in press in dies made to exact shape and is known as the "Interlocking Blank." After blanking from sheet of metal to required shape it is passed through rolls on the bowl end, which is known as *cross rolling* and widens the bowl end of blank to the proper width from which to cut out the bowl of the spoon. It is then passed through the grading rolls, which gives the required thickness of the spoon when cut out to shape. When this style of blank was devised and the subsequent processes of cross rolling, etc., applied, it was thought to be almost impossible to improve on the method in the way of saving weight on the base metal for making spoons, forks, etc., but master minds and genius conceived the idea of a blank as shown in Fig. 3.

This blank is cut out in a press, the same as Fig. 1; blank in Fig. 2 being interlocking but of different shape and lines. After blanking to shape this blank is put through dies made for the purpose and is squeezed or swaged to nearly twice its original thickness. In the shank, where it is required in the handle of the spoon, the tremendous pressure required to squeeze or upset the metal also lengthens the blank considerably. The blank is then passed through the grading rolls, the same as blanks in Figs. 1 and 2, to get the correct grade for the spoon. This blank and method eliminates the cross-rolling process as used in Fig. 2, and also reduces the weight of the blank about two (2) pounds per gross. This swaged blank requires only about twenty-seven (27) pounds of metal per gross, where that in Fig. 1 requires sixty (60) pounds, and in Fig. 2, twenty-nine (29) pounds respectively per gross.

So it shows what advancement has been made in the saving of metal to make a gross of spoons from the olden

FIG. 3. A STILL MORE MODERN FORM OF BLANK WHICH IS "SQUEEZED" OR "SWAGED," AND "CROSS ROLLING" IS ELIMINATED.

time methods until the present time, and the writer believes that in the near future the methods of spoon making will be so improved that it will be possible and practicable to manufacture spoons and forks, and almost entirely eliminate all scrap or waste metal in the manufacture. With this accomplished we can look back over the past and say surely that we have kept pace with the present age and accomplished great things in our line of work and, though, like the Egyptians of old, we could not make brick without straw, but we can say that we can make spoons and forks without wasting metal. I have no doubt that the time will soon come when we can exclaim, "Eureka"—we have found it.

METALLIZING SILICEOUS SURFACE.

A process of giving a metal coating to siliceous surfaces, such as those of glass, pottery and the like, is given in La Revue des Produits Chimiques. The method consists in treating the surface, which must not be enameled or varnished, with a solution of silver fluoride, and then exposing it to the action of a current of illuminating gas. The article is later exposed to a temperature of about 50 degs. C., and while at that temperature exposed to a current of bisulphide of carbon. These operations result in the deposition of a finely divided deposit of silver on the non-conducting surface. To secure the best results this deposit should then be burnished, after which it can be used as cathode in an electrolytic bath.

PLATING AND REFINISHING RAILROAD LOCOMOTIVE HEADLIGHT REFLECTORS IN NICKEL

By Charles H. Proctor.

The refinishing of locomotive headlight reflectors is quite an important business when we take into consideration the thousands of locomotives used in the United States and other sections of the American continent. In England and other Continental countries stationary lamps are used as signals only on the locomotives, so very little refinishing of reflective surfaces is needed in such countries.

It is well known by those interested in refinishing such articles that they are nearly always made up from sheet copper of varying thickness with a diameter of from 14 ins. to 22 ins. and a depth of from 10 ins. to 20 ins. It has always been customary to silver plate the exposed surfaces and then produce a high lustre by burnishing by hand or machine and then buffing to even up the tool marks of the burnisher. The exterior of the reflector, after the finished surface had been prepared for plating, is usually coated with an asphaltum varnish to protect the silver from depositing on the outer surface and also prevent the needless waste of silver. After the plating and finishing operations, the asphaltum varnish is seldom removed, but for appearance was coated over with a second coat of a dead black lacquer. This applies to new work but quite frequently in the refinishing of worn reflectors the same method is adhered to.

The amount of silver deposited upon the surface of the reflector depended upon the price paid, but for wearing qualities not less than one ounce Troy per square foot of surface should be applied. Years ago when the writer was doing this class of work the amount of deposited silver was guaranteed, as in the plating of steel knives, the reflectors were carefully weighed before and after plating. But in these days of competition it is difficult to tell how much silver is applied. The railroads, unless they do the refinishing themselves, usually give the work to the lowest bidder without any consideration as to the wearing qualities of the reflective surface. When such reflectors are put to the test the wearing qualities are probably at least 50 per cent. less than a guaranteed reflector and so the cost, instead of being less according to the price paid, frequently costs 50 per cent. more in the end.

Some eighteen years or more ago, when the price of metallic silver was selling as high as $1.25 per Troy ounce, experiments were made under the writer's supervision by an expert in reflective light to determine if a highly finished nickel-plated surface could not be used instead of silver. These experiments were carried out in a suitably arranged dark room over a considerable period and according to measurements made, very little difference in the reflective powers of the two metals upon an equally polished surface was noted. It would naturally be inferred that on account of the whiter color of the silver that the reflective power of the metal would greatly exceed that of the nickel, but as reflectors are usually used for penetrating darkness and receive only the reflection of the artificial light created for reflective purposes, it can be readily seen that with surfaces of equal brilliancy very little difference in the reflective powers of the two metals would ensue.

Acting upon such measurements and due largely to the high price of silver at the time mentioned, the firm in whose employ I was at that time commenced the finishing and refinishing of headlight reflectors in nickel. The finish proved to be satisfactory for the purpose; in fact, the nickel retained the lustre longer and was not acted upon by sulphurous vapors that come from the burning of the coal. If such reflectors had received the same care as the silver reflectors (a light cleansing every day) all the railroads would probably be using nickel-plated reflectors today, but neglect of this duty caused the reflectors to eventually become dull from moisture and atmospheric influence and it was then more difficult to produce a polished surface upon nickel than silver so the deposit of nickel was eventually discarded.

At the present time a number of railroads are using gas as an illuminant instead of the ordinary kerosene lamp that was in use for so many years. They find that the silver does not stand the heat sufficiently and becomes discolored quite rapidly, so they have turned again to nickel and find the deposit very satisfactory when gas is used for the illuminant instead of kerosene lamps. One of the difficulties experienced in plating such reflectors in nickel is the unevenness of the deposit. This is due to the depth of the reflector. The deposit is satisfactory for reflectors with a depth of up to 14 ins., but beyond that the deposit is very light and cuts through quite easily when the surface is repolished after plating. In using ordinary baths for silver-plating and the ease with which silver is reduced, this trouble of uneven deposit does not occur, but owing to the higher resistance of a nickel solution and consequently lower conductivity this difficulty occurs on surfaces such as locomotive reflectors with unusual depth.

To overcome this difficulty the reflectors should be plated in separate receptacles, preferably of stoneware, with sufficient capacity so that the reflectors could be immersed at least four inches below the surface of the solution, the front or widest part of the reflector being immersed in the solution upwards. The outside of the reflectors should be coated with asphaltum so that the solution would not remove any oxide that might be on the outside surface and contaminate the solution. Specially arranged anodes should be used and if possible should conform to the shape of the reflectors so that as much anode surface can be exposed as possible to replenish the solution. As rolled nickel can be obtained quite soft it should not be much trouble to fashion the nickel according to the shape required for the anode. If cast nickel anodes are used they should always put in a cheese cloth bag to prevent the impurities from falling into the reflector and thus causing a speckled deposit.

In arranging the stoneware jars or other receptacles for plating the reflectors separately, they should be in groups of six or more in a straight line. Only one anode rod extending over the six or more jars needs to be used. If possible this rod should have a slight motion. The negative rod can be arranged a few inches above the jars or tanks and one rod can be used for the purpose of connections. The advantage of using separate receptacles is the readiness by which the solutions can be filtered. This is absolutely necessary in nickel-plating reflectors according to the method given. The composition of the solution that was found satisfactory for this class of work consisted of the following proportions:

Double nickel salts	6 ounces
Single nickel salts	2 ounces

Sodium chloride	1 ounce
Ammonium chloride	1 ounce
Water	1 gallon

The solution should be tested with blue litmus paper, and if not sufficiently acid a very small amount of a concentrated solution of citric acid should be added to each solution until the blue litmus is colored a very faint red.

The introduction of concentrated nickel salts such as Prometheus and other like salts that produce concentrated solutions and rapid deposits should prove valuable in nickel-plating reflective surfaces.

In polishing locomotive reflectors the methods to be used are: First, cutting down with bristle brush wheels, using an emery composition of 120 to 150 fineness or the same grade of emery and oil; then cutting with tripoli and rag wheels and coloring the surface with soft buffs for a high finish. After plating color with a fine grade of white composition. In refinishing reflectors that have been previously nickel-plated much labor will be saved if an acid strip is arranged. For this purpose the proportions should be four parts of sulphuric acid, one part of nitric acid and the addition of water to produce a smooth surface. Such strips should be used warm and maintained so by the use of lead coils. A good, strong suction blower should be connected above the stripping tank so that the fumes will be rapidly carried away. In stripping a great number of reflectors the solution when once warmed remains so by the action of the acids upon the metal.

MODERN METHOD OF MANUFACTURING METAL CORE BOXES USED ON PLUMBING AND STEAM BRASS GOODS

By P. W. Blair.*

It is on brass in the non-ferrous metal line that the core box has reached its greatest state of perfection, and few outside the shops turning out this class of goods ever see or hear of the complicated core boxes used. Some of the more complicated forms call for the highest mechanical skill of the metal pattern-maker. The making of metal core boxes used for producing cores for cocks and valve bodies used in the manufacture of plumbing and steam brass goods is a trade by itself and is classed with die-work, and is considerably above the ordinary run of die-sinking used in press or drop forge work. At the mention of the subject of core boxes or core box making, we are liable to conjure up visions of clumsy wooden affairs that we have seen stacked up in the out of the way corners of some foundries.

In the manufacture of brass goods, such as gas and water cocks, valves and the various fittings used in the plumbing and steam fitting trades, the cavity or cored part plays a very important part in the ultimate cost of these goods. If the cored part or cavity is smaller than necessary, too much metal is used, and at the market cost of brass it would soon amount up to money, as the saying is. On the other hand, a cavity that is too large would weaken the fittings and cause loss of castings and reputation of the manufacturer, if they got on the market, as they would be unable to stand the wear or pressure. Taking these items into consideration, one will at once see the importance of having the cavity of the correct size and proportion, and as the cavity is produced by introducing into the mold a form which is produced by pressing a mixture of sand, flour and oil into a core box, and then baking the form produced in a special oven, then the care with which this core box must be made will be fully realized.

MATERIAL FOR CORE BOX.

Originally many core boxes were made of wood, but for many reasons this is not advisable where any number of cores are required. If there are only a few cores to be used per year, or the cores are of a large dimension, it is then practical. Brass is now used to a very large extent in making metal core boxes, as it wears well and machines good, although the corners are liable to wear and round off. It is much easier to work slab machine steel, which is the best material to use in the manufacture of core boxes, as it has good wearing qualities, but it is the most expensive to work. The wearing qualities of machine steel are indefinite, as after the core box is finished it can be case-hardened and it is almost indestructible. In some of the large brass manufacturing plants manufacturing plumbing and steam brass goods they average fifty to two hundred thousand acres of one kind per year, so in the end it pays to use the best materials in the construction of their core boxes.

The use of slab machine steel necessitates the cutting of the slabs into different dimensions and shaping them up. Two of these pieces are usually fitted together with dowel pins and the core shape worked out of them, one half being worked out of each piece. In order to avoid trouble and confusion in the use of dowel pins, certain standard sizes are used. These pins are carried in stock and made in two styles and several sizes. The blue prints always specify the kind to use. A dowel pin chart is hung in the metal pattern-maker's room in a convenient place for ready reference.

MAKING THE CORE BOX

After the two halves of the core box have been fitted together, the next step is to lay out the outline for the core, which it is intended to form. To do this, the pieces are separated; the inside surface of one of them is coppered and the outline laid outlined and scribed from the blue print or templet. The pieces are then put together and the circumferences of the holes to be bored are scribed on the ends of the blank which has previously been coppered in the same way as the inside face. A special two-jawed box chuck is used to hold the work, which allows same to be turned up sideways only, as per Fig. 1. A raised rib "A" on the false jaw of the chuck squares the blank and the jaws turn it up and down. An adjustable stop "B" fastened to one jaw of the chuck is set wherever it is required. This arrangement permits the work to be taken out and inspected as often as desired, and then replaced without changing its position. This is a very important matter, as in many core boxes the cavity is so small that the work must be removed and taken apart to clean out the chips which otherwise might clog up the tool and tear the metal. Many special shapes of boring and forming tools are used in cutting out the core shape. These are usually forged from drill rod to be used on small cavities.

On some styles of core boxes a templet is made of sheet steel which has one edge shaped like the outline of one half of the core. The templet is fastened to the taper attachment of the lathe and by keeping a guide on the cross slide against this the hole is bored out the desired shape. Self-hardening steel is used for special shaped tools wherever possible. Small pieces of various sizes are kept on hand and ground to the shape wanted and a number of different shaped holders are kept for their

*Foreman of Brass Finishing Department of H. Mueller Manufacturing Company, Decatur, Ill.

use. Most of the work on the inside of the core boxes is done without the operator being able to see the cutting edge of his tool, therefore, positive adjustable stops must be used to limit the movement of the lathe carriage along the bed. Sometimes in long boxes, same as center one in Fig. 2, with a long cavity, a 90 degree tool is used in the shaper and a long groove is cut in same.

VARIOUS STYLES OF CORE BOXES.

For simple cores multiple boxes are made, sometimes as many as six or eight cavities of the same size and

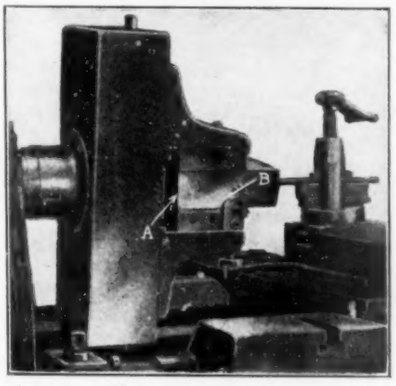


FIG. 1. SPECIAL TWO-JAWED CHUCK TO HOLD CORE BOX FOR BORING.

shape being placed in the same core box. One of these in its simplest form is shown to the right, Fig. 3. It is quite an interesting and mechanical job to work out the cavities for waterway plumbing and steam brass goods core boxes, owing to the different angle, and in some shops they are made in sections cast from wood patterns with the cavities cast in same at a reduced size to allow same to be worked to correct size.

Compression bibb body and valve body core boxes are very difficult to make, owing to their irregular cavities,

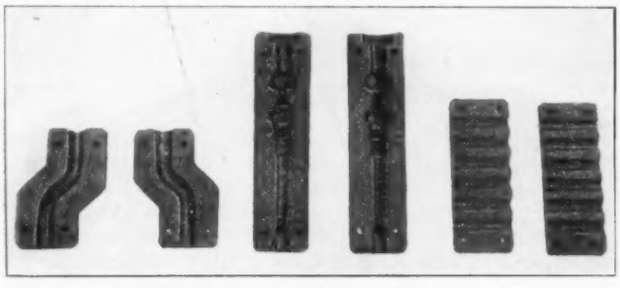


FIG. 2. SHOWING LONG CORE BOXES WITH BENDS AND DEEP CAVITIES.

and special cutters have to be used on same. These special cutters are made from high-grade tool steel and turned up to the exact diameter and shape that the core is to be, after which they are hardened and tempered. As a usual thing these cutters are used in the lathe, though, whenever possible, a milling machine can be used and the cavity milled out. The cutter is held in the chuck and one half of the box is clamped to the cross-slide and fed against it. After the two halves have been cut out in this manner they are put together on the cutter and clamped, then the cutter revolved, and the clamp being gradually tightened until the two halves of the core box are tight together. This insures a cavity the exact size of the cutter, which is the desired size of the core. The balance of cavity that can not be machined is chipped, filed and scraped out, and is a slow, tedious job of hand work. To rough out some of the cavities that can not be machined on the lathe a small electric bench grinder with small emery wheels can be employed to good advantage.

On the left, Fig. 4, is shown a core box for an offset-coupling core, shaped something similar to the letter S. A hemispherical cavity is bored just where the two curves meet, its diameter being the same as that of the ends of the hold and its depth one half of this. One half of the blank is then clamped on the face-plate and the curved cavity worked out, the face plate being worked back and forth by means of a lever bolted to same.

Many of the simple core boxes require only from two to four hours work on same after the parts are fitted and

FIGS. 3 AND 4. SHOWING SIMPLE FORMS OF MULTIPLE AND OFFSET COUPLING CORES.

dowelled, while others require as long as forty hours and even sixty hours sometimes until they are complete, so they are a valuable asset. Sample castings are made that a new core box has been used on before and then taken and sewed up to make certain that the metal is of the correct thickness in all of its parts; if not, the core box goes back to the metal pattern shop with sketches and instructions to alter where required. It is then "O. Kd." when found satisfactory and put into actual use. You then have a core box of durable material and good wearing qualities. When not in use the core boxes are stored in a fireproof vault, and each core box has a number on same for record and identification.

POROUS METALS.

Herr H. J. Hannover, who has made microscopic studies of the various metals, has made some very interesting discoveries in reference to their pores. He found that when an alloy consisting of 96 parts of lead and 4 of antimony was heated nearly to the melting point, and then let cool, at first small, growing crystals separated, but that at a temperature of 442° F. the contents of the "passages" between these also "set." The observations were even more interesting in the alloy when reheated; it appeared that the contents of the "canals" were the first to melt, the rest becoming fluid by further increase of heat. In a hot furnace the contents of the spaces between the crystals could be separated by centrifugal force, so that a porous lead plate resulted.

The first experiments yielded a lead plate with crevices, probably resulting from the centrifugal force. But making the experiments in such a manner that the lead plate was surrounded by an iron pocket having one side of brass wire cloth through which the melted metal could be thrown, it was possible in the very short time of six minutes to produce several porous lead plates, having millions of microscopically small pores. Calculation showed that the surfaces exposed were fifty times as great as before the centrifugal process.

The invention of this porous metal is especially interesting and important for the accumulator industry.

The Danish State Railway authorities have had practical tests made with these new lead plates, with the result that they were shown to increase the capacity of the accumulators made therewith four to five fold.

ROBERT GRIMSHAW.

THE CORROSION OF ALUMINUM*

By G. H. Bailey, D.Sc., Ph.D.

Taken in its widest sense, the question of the corrosion of aluminum is much too large to be dealt with in a single communication. Furthermore, it is of a diverse nature both in regard to methods of inquiry and to results, so that when we examine the action of the atmosphere or atmospheric agencies, the action of water under varying conditions and purity, the action of mineral or organic acids, of alkalies and alkaline salts, and of organic liquids, we are confronted with a series of sectional and more or less independent investigations. In the present communication I propose to confine myself to the consideration of the corrosion of aluminum by water and by solutions of common salt, and to give some of the results of investigations with which I have been from time to time engaged during the past three years. The literature connected with this subject, some references to which are given at the end of this paper, is already quite considerable, and I do not intend to refer to it in detail. Many of the experiments that have been published are, however, open to criticism, partly on account of the methods employed and partly in consequence of the material upon which the experiments have been made, and hence the conclusions that have been drawn are apt to be misleading.

There are, for instance, investigations from authoritative sources in which the rate of corrosion is determined by reference to the weight of metal employed, when manifestly this factor must be referred to the surface exposed to action. In some cases the value attaching to estimates is lessened by the consideration that the samples of metal used were of a very low grade of purity—usually under 99 per cent. purity—whereas the bulk of the metal which is supplied for commercial use, in this country at all events, is of 99 per cent. to 99.5 per cent. purity. Moreover, impurities which are still liable to exist in the metal, such as sodium and copper, and which have a very marked effect on the extent of corrosion, are apt to be ignored in the investigation of corrosion, whilst other impurities whose effect is usually negligible are given too large a significance.

An interesting series of determinations bearing upon the effect of copper on corrosion appears in the 8th Report of the Alloys Research Committee, by Carpenter and Edwards, pp. 216 and 254.

ESTIMATION OF THE EXTENT OF CORROSION.

The first step towards obtaining some definite knowledge relating to the corrosion of aluminum must involve the adoption of a method of ascertaining with approximate accuracy the amount of metal removed or acted upon during the exposure, and it is perhaps of greater importance that the method adopted should be capable of use in the hands of different experimenters and yield comparable results than that it should be rigidly accurate.

If aluminum sheet be exposed to the action of water for some days, it will be found that the water becomes slightly turbid owing to the formation of hydrate of alumina. On the sheet being removed and the surface rubbed, a further amount of such solid matter is obtained. It is seldom, however, that the whole of the adherent deposit can be removed by rubbing, for the sheet will, even after such treatment, usually be found to be slightly heavier than it was when first placed in the water. The deposit on its surface, though essentially alumina, varies in character and composition according to the nature of the aluminum sheet and of the water employed, and, with impure waters, may contain some matters derived from the water itself.

Messrs. Heyn and Bauer (Königliche Material prüfungsamt Gross Lichterfelde West) recognized the difficulty of removing and estimating such deposit, and determined the adherent portion (which is as a rule larger than the amount suspended in the water) by exposing the sheet subsequently to the action of dilute sulphuric acid, evidently on the assumption that the acid would dissolve the deposit without notably attacking the metallic aluminum.

Unfortunately, the reverse is the case, for usually the exposure necessary to remove the deposit is so prolonged that it is quite impossible to ignore the action of the acid upon the aluminum, nor have I found it practicable even by a consecutive series of immersions and weighings to arrive at the amount of the deposit in this way. The association of chromic acid with sulphuric acid hastens the removal of the deposit, but does not attain the desired result. Other reagents and other means have been tried, but without any satisfactory issue. I have therefore in my experiments used the method now described.

METHOD FOR DETERMINING RATE OF CORROSION.

A sheet of aluminum, of at least 100 square centimetres surface, is cleaned by the application successively of ether, dilute caustic soda, and dilute nitric acid, subsequently being well washed and heated for some hours at about 100 degs. C. to get rid of moisture. It is then weighed, the weight being taken as W.

It is now totally immersed in say half a litre of water, or solution, at a known temperature, and left with occasional agitation for at least forty-eight hours.

The sheet is then removed and, so far as possible, cleared of deposit by rubbing. The whole of the substance so removed or previously suspended in the water is filtered off, ignited, and weighed. With good ordinary sheet this material consists almost entirely of alumina, and in view of minor corrections, which need not be referred to, may be taken as representing half its weight when expressed in the form of metal. The weight so found being represented as w, it is evident that, ignoring the adherent deposit, the sheet should now weigh $W - w$.

Now expose the sheet for some hours to a temperature of about 200 degs. C. to render alumina anhydrous, and weigh it. This new weight being represented as w', the expression $w' - (W - w)$ gives the amount of adherent deposit, and this similarly is reduced so as to be expressed in the form of metal.*

With very impure metal, or when very impure waters or solutions are employed, the residue obtained in both cases may be of more complex character, and must be submitted to further examination. But in general the amount of metal removed may be ascertained from the above factors. An actual example will make the matter clearer and indicate the order of magnitude of the materials dealt with. A strip of aluminum sheet, whose weight was 6.4978 grammes and surface 150 square centimetres, was exposed to good tap water at boiling temperature for eight days; the suspended deposit weighed 10 milligrammes; the sheet after rubbing weighed 6.5062 grammes. The deposits amounted to 10 and 13.4 milligrammes respectively, and the metal re-

*Paper read at the meeting of the Institute of Metals, held in London, March 11-12, 1913.

*The total aluminum removed by corrosion may, for practical purposes, be more simply expressed as three-fourths of the weight of suspended and removable matter added to one-half of $(w' - W)$.

moved by the action of the water was thus 11.7 milligrammes. This represents a rate of corrosion amounting to very nearly 1 milligramme of aluminum per day per 100 square centimetres of surface exposed.

NATURE OF CORROSION.

An examination of the liquid in which the metal has been placed shows that, except in waters containing free acid or alkali in notable quantity (and such waters are rare amongst domestic supplies), no aluminum whatever passes into solution, and that the corrosion is purely a question of oxidation of the aluminum to alumina at the expense of the oxygen dissolved in the water. This important result may be further established by exposing the metal to water from which the air has been expelled. Samples of aluminum sheet have indeed been exposed under such conditions, not only to water but also to a strong (15 per cent.) solution of common salt for several months without undergoing any corrosion. It follows also from this of course that especially if the surface of aluminum be large in comparison with the volume of water used and no measures are taken for renewal of the air contained in the water, the rate of action gradually diminishes.

This is most strikingly the case when hot, and particularly boiling, solutions are used. For instance, a sample of sheet exposed to the action of water at about 95 degs. C. for thirty days showed a rate of corrosion:

During the first day equal to .....3.3 milligrammes per 100 cm.² per day
During the next 7 days equal to.....1.2 milligrammes per 100 cm.² per day
During the next 11 days equal to.....0.3 milligrammes per 100 cm.² per day
During the next 11 days equal to.....0.1 milligrammes per 100 cm.² per day

This falling off is also partially due to the protective action of the deposit formed on the surface of the metal, so that vessels or tubing exposed to continuously heated water undergo very slow corrosion.

Determinations made by the method described above serve only to ascertain the amount of the metal removed by corrosion, and have little direct bearing on the specific nature of the physical phenomena or other exceptional conditions often associated with corrosion. Nor do they afford any explanation how it comes about that two particular samples, substantially of the same composition, may show somewhat different rates of corrosion.

(To be continued.)

THE ROLLING OF COPPER

SOME PERTINENT OBSERVATIONS UPON THE PRESENT METHODS OF HANDLING THE RED METAL.

BY COPPER ROLLER.

Are we progressing? I think there has been but little advancement made in the line of copper rolling within the last hundred years. The Buffalo Copper and Brass Rolling Mills, at Buffalo, N. Y., the latest in the business, are working the old Welsh system, that of cross rolling. That is to say, rolling cake copper to 24 or 26 inches wide and about ¼ inch thick, cutting the same to desired weight and cross rolling to required width; the slowest, and without doubt the most expensive, of all known ways in the business, in labor, fuel and percentage of scrap. This mill, being one of the latest built, is the best equipped of any in the business, having electric driven motor power, which should enable it to put its product on the market at less cost than any other.

The system in use at the present time in most mills is the straight rolling system, which is rolling the copper plate to width ¼ or 3/16 thick, cutting it to desired weight for given size sheets when finished, sending them to the fininshing rolls. First they put from 15 to 20 pairs of these pieces into the furnace to be heated; when they are heated they are rolled double, or two pieces together to a thickness of about 1/16 or a little less. They are then sent to be trimmed to width and weight and returned to the same roll and then packed in packs of five or six and heated once more and then rolled to the desired length. Under this system on a finishing roll, from forty to forty-five hundred pounds of standard sizes are rolled per ten working hours. There is, however, the same percentage in scrap as in cross rolling, but a saving in labor and fuel.

Still another way in use is that of rolling the plate to the required width and ¼ thick, cutting in two pieces, heating once more, rolling to 1/16 thick, after which it is trimmed to width and weight. It is then sent to the finishing rolls to be packed and rolled in the same manner as the one previously stated. There is a saving of 10 per cent. in scrap and a difference of a thousand pounds in weight per ten hours over the other two systems.

Having had a quarter of a century of practical experience in this line of business I have come to the conclusion that it is size or diameter of the rolls in common use that accounts for the inability of the men working these rolls to increase the tonnage per day. The diameter of rolls used for copper rolling varies in sizes from 18 to 24 inches. This is one great mistake, for it is not the speed of the roll which counts; it is the diameter. I have tested out a 20-inch roll at a speed of 37 turns a minute on a finishing mill in comparison with a 30-inch roll at a speed of 20 turns per minute. The 20-inch roll was doing forty-five hundred pounds of sheet copper 38 by 100 inches, 16 ounces, in ten hours, while the same amount was done on the 30-inch roll in five hours.

I have proved to the satisfaction of myself and several others that copper can be rolled down from the cake to 1/16 inch thick, cut into pieces, annealed, and then packed in packs of four or five sheets and rolled out cold, which is only heating twice to fetch it to standard sheet sizes of 12, 14 or 16 ounce copper. This copper will answer for any of three purposes in our line of business, cold rolled polished or cold rolled and annealed, or plain cold rolled copper. This is a saving of time and labor and also makes a better sheet of copper in every respect to that of a hot rolled sheet and can turn out from eight to ten thousand pounds a day.

I may say that in the near future this system will be commonly used in all copper rolling mills. There are a few copper rolling mills experimenting with the large diameter rolls, but in this business, like many other concerns, the superintendent or shop management is most generally in the hands of inexperienced office help promoted to that position without any practical knowledge of the business, and the workmen, knowing the inability of the management, hides facts from them. Therefore, that concern which will equip its mills with the larger diameter rolls will revolutionize the copper rolling business. It will be able to produce its copper at one-half the present cost, for the increase in tonnage will reduce the scrap from 45 to 25 per cent., with a reduction also of 20 per cent. in labor and 50 per cent. in fuel.

A MODEL METAL CASTING SHOP OF THE NAUGATUCK VALLEY

By Guion Thompson.*

(Concluded from April.)

HANDLING THE FUEL.

The crane when taking coal is on a section of the runway attached to a weighing scale and the operator in the crane observes and notes the weight of the coal taken. The operator controls the hinged section of the chute as well as the chute gate, from the cage when the crane is standing on the scale. After filling his coal bucket, he proceeds with it to the casters' bin for which it is intended. As may be seen in Figs. 1 and 2, and as has been described, these bins are directly under the crane runway between the casters' fires and the crane operator stops above the bin to which he wishes to deliver coal, and lowers the bucket to the top of the bin where it automatically dumps. This operation may be understood by reference to Fig. 3, which is an illustration of the coal and ash buckets, showing the manner in which they operate.

The bottom of the bucket is of two slanting sides like a gable roof, and the rectangular body forming the ends and sides of the bucket rests on the outer edges, or eaves, of this bottom. Bails from the ends of the ridge of the bottom extend up inside the ends of the rectangular part of the bucket. A beam suspended by the crane engages with these bales and the bucket is lifted, lowered and carried by this beam, which is attached to the crane hoist hook. The sides of the bucket body rectangle have angle iron ledges attached to them which rest on supporting beams across the opening in the casters' coal bins, so that when the operator lowers a bucket of coal and the ledges come in contact with the supports across the coal bin, the weight of the coal in the bucket continues to move the bottom downward, so allowing the coal to flow through and out at each side. When the operator again lifts, the bottom part comes up, too, and then lifts the rectangle forming the ends and sides of the bucket.

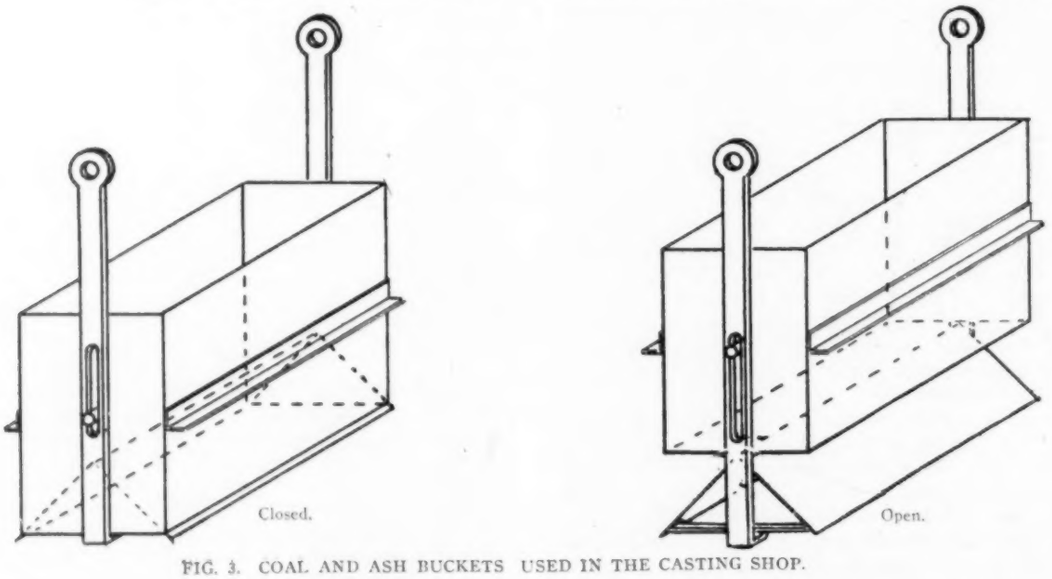


FIG. 3. COAL AND ASH BUCKETS USED IN THE CASTING SHOP.

POWER AND LIGHTING EQUIPMENT.

In the court between the two casting shops are four small buildings whose floors are at the same elevations as the main casting shops cellar floors and whose side walls are integral with the foundation walls of the main buildings and stacks. The stack foundations make the end walls of and the divisions between these four buildings, the roofs of which are clay and glass tile supported on angle iron trusses. The northerly room is called the power room and contains a 50 kw., 250 volt direct current generator, direct connected to a two-cylinder non-condensing vertical steam engine taking steam from the steam line which comes underground from the mill boiler house, about 400 feet away and exhausting into the casting shop heating system. In this room there is also a 100 kw., 250 volt, direct current generator coupled through a flexible coupling of the leather-belt type, to a 150 horsepower, 3 phase, 220 volt, squirrel cage type induction motor taking energy from the Public Service Company at the present time.

Across the north end of this room is a natural slate switchboard. There are two generator panels, a panel for the induction motor, a lighting circuit panel and a power circuit panel. At first the lighting circuit panel distributed energy to the lights from the main buss line, but at present takes energy from the 110 volts secondary of a transformer connected to the public service company, thus relieving the generators of the lighting load. The generators supply all the energy for driving the machinery in all the casting shop buildings, including cranes, distribution being at 250 volts direct current from a straight two-wire tree system of mains to panel boards conveniently located to the various load centers, each motor or section of crane runway taking energy from the nearest panel board, separate boards being used for crane and machine service. The connected load consists of 275 horsepower distributed between 22 motors ranging in size from ¼ horsepower to 40 horsepower and 7 monorail cranes, 2 three-ton bridge cranes, 1 five-ton bridge crane and the coal pocket bridge crane.

One hundred and ten volt Tungsten lamps of various sizes are used throughout the buildings, except where it is

*Consulting engineer, Waterbury, Conn.

necessary to support lamps from the main floor structure for cellar illumination, in which case carbon filament lamps are used, Tungsten having proved too fragile to withstand the severe blows to which the floors are subjected. 250-volt direct current enclosed arc lamps were used at first and discarded because of the high cost of maintenance and energy consumption and poor illumination due to the impossibility of obtaining a constant and efficient diffusion of the light flux from this type of lamp.

HEATING AND WATER SUPPLY ARRANGEMENTS.

The second of the four rooms between the casting shops is called the heater room, and contains the equipment for heating the buildings and furnishing the hot water to wash rooms, etc. Steam obtained from the main boiler plant is used to heat the water which is circulated through the heating system in the buildings by duplicate sets of motor and steam driven pumps. Steam is also taken from the exhaust of the steam driven water circulating pumps and the generator engine in the power room. The buildings are heated by a system of horizontal pipes along the side walls at the floor line. The casting shops proper, although equipped complete with heaters on both side walls, do not require heating, except in the very coldest weather, as the heat from the furnaces and the nature of the work make it unnecessary to supply artificial heat other than that required to prevent freezing of the water and air pipes in the mold pits. The sides of the casting shops being practically all shutters make the ventilation of these sheds very complete.

The third of these rooms is a store room for the storage of molds, crucibles, and extra motors, machine parts, etc. The fourth room is equipped as a blacksmith shop, with forge, steam hammer, drills, etc. These four rooms are entered through doors from the main cellar floor, the power room from the east side, the heater and store rooms through doors in each side, and the blacksmith shop from a door in the south wall.

Between the metal storage building and the adjacent casting shop are located the wash rooms. They are separate steel, brick, concrete and tile, one-story buildings, whose floor elevation is about one-half way between that of the main and cellar floors of the main buildings of the casting shops proper. The casters' wash room is at the north end of this court and is entered by steps and a door at the north end, from the floor of the north passway between casting shop and metal storage building. The casters' helpers' wash room is the one at the southerly end of the court and is entered in the same manner from the south passway. Both rooms are fully equipped with sanitary metal lockers, wash basins, shower baths and water closets.

The water supply for the buildings is obtained by means of a well located in the passway between the metal and coal storage buildings, and which gets its supply of water from a canal passing along the south wall of the shops. There are two vertical shaft, 13 horsepower motor driven centrifugal pumps in this well. The pumps are at the water level and the motors at the top of the shafts on the cellar floor level in a small room built off the main cellar-way, the cellar about this section, being near the ash reclaiming plant, is utilized for storing and reclaiming and breaking up the old and useless crucibles. The general arrangement of the removable floor plates throughout the buildings, in connection with numerous monorail crane runways, make it extremely convenient to carry on operations of various kinds almost anywhere about the shops and passways and in the cellars.

DEVICES FOR HANDLING METALS.

Two tracks come into the north end of the metal storage building from the yard, one at each side of the building and on the main floor level. They are supported on concrete cross piers which form division walls between the storage bins beneath the floor. The main floor is omitted in the center of the building, as shown in the sketches, this opening being surrounded with a heavy pipe railing, or fence. The floor over the bins between track and railings is of cast iron plates resting on steel I-section floor beams. The balance of the floor is of cast iron plates set in concrete. Parallel to the main tracks is an industrial track cast in the iron floor plates on which are operated small hand-propelled four-wheeled flat cars (for emergency or short transfer of metal to the bins) and an unloading conveyor and spelter breaker.

These floor plates are removable over all bins so that cars may be unloaded directly into any bin. Through the center of the floor opening, and parallel to the bins under the floors at each side is a double row of sheet steel bins, back to back, with a space, or alleyway, each side between them and the side bins. These center bins are loaded from the cars by means of a chute extending from the cars over the railing and alleyway to the open top of the bin, and also by a motor driven spelter breaker and conveyor which rests and travels on the industrial track. This machine consists of a truck traveling on the floor track, and on which is mounted a combined hopper and intake chute opening toward a car standing on the main track at such a height that a man on the car floor drops the metal into the chute without exertion. This chute is attached to the top of the breaker proper which is driven by a 15 horsepower motor and starter also mounted on the carriage, as is also the receiving and driven end of the belt conveyor, the other end of which is supported by a double flanged wheel traveling over the central division wall of the double row of bins before mentioned. The conveyor is arranged to deliver to any bin in either row. The motor derives its propelling energy through a flexible cable and plug to receptacles mounted at intervals along the hand rail at the floor edge. The machine is pushed along the track by hand to the car to be unloaded, the plug inserted in the nearest receptacle and the motor started. Three men are required in the car to feed the metal into the hopper as fast as the machine will take it, and it is broken crosswise of the cake into pieces 3 inches or more in length. As broken, the metal falls on to the conveyor belt and is delivered by the conveyor to the bin. The machine requires about 4 kw. per hour to operate and breaks about 10 times as much metal as one man can break by hand. At the south end of this building are electro-pneumatic cabbaging machines, motor driven scrap winders, shears, magnetic separators and a small annealing furnace for annealing scrap which is too stiff to cabbage properly. All these machines are of the usual type, except that they have been adapted to individual motor drives.

Cars bringing in scrap are run in on either the west or east track, and the scrap unloaded on to the floor, cabbaged and delivered to the bins on hand cars or trucks. All the ingot and new metal comes in on the west track and is delivered to bins, as has been described. The track on the west side runs over the full length of the row of bins, while that on the east side does not come so far south, in order that the necessary floor space may be had on which to carry on cabbaging operations. The north end of the bins is some distance south of the north end of the central floor

opening, which provides an open floor space, or so-called conveyor pit, on the lower floor level where pan racks are loaded with the pans containing charges for the crucibles. Through the center and on the floor of each of the two alleys, or aisles, extending between the center and side bins, as before explained, is a link conveyor which extends out the north end of these alleys and across the floor of the conveyor pit. Each of these conveyors is operated by a 7½ horsepower interpole shunt wound motor located with its controller at the end of the conveyor.

Sheet iron pans about 30 inches long x 15 inches wide x 8 inches deep are used in which to make up each crucible charge. These pans are lowered by cranes through an opening in the floor at the south end of the rows of bins. They are placed on the moving conveyors at intervals of 25 or 30 feet. There are small platform scales mounted on tables, one-half of the top of which consists of a hopper. The legs of these tables are supplied with small casters. The tables are placed over the conveyors, two legs on each side, with the scales in the direction from which the pans come and the hopper in the direction in which the conveyor moves. As a pan passes under these tables, it engages with and trips the hopper bottom so that anything in the hopper slides out and into the pan and is conveyed away by it. Attendants taking metal from the storage bins weigh it on the scales, place the proper weight of copper or scrap, or spelter, according to which they may be handling, in the hopper and as a pan moving along on the conveyor passes under, it takes that part of the charge which that operator may be weighing out, taking up the other parts as it passes under other hoppers in its course through the alleyway on its way to the conveyor pit, where it arrives with a complete crucible charge.

Two attendants lift it off the conveyor and slide it into angle iron racks standing to one side of the conveyor. Each of these racks carries 25 pans in 5 rows of 5 each, one above the other. They are slid in crosswise of the racks. These racks are built of heavy angle iron and provided with gable-shaped end framing at the top, forming bails into which a special double hook carried by the cranes may engage. Bridge cranes operate over the entire building, lifting out these loaded pan racks, carrying them up and placing them on the main floor at the north end of the building where they are again picked up by monorail cranes carrying them directly to the casting floor. The bridge cranes are also used for transferring the loaded or empty hand cars and racks across the central floor opening, in loading and unloading cars, especially flat or open top cars.

On the main floor at the north end of the building are also located two large alligator shears, each driven by a 40-horsepower compound wound motor and used to trim the metal plates and rods as they come from the molds. From this floor the metal is also shipped out, horse and motor trucks driving in on the floor under the cranes, the same cranes loading and unloading either trucks or railroad cars and transferring and distributing the metal almost anywhere in the building, at will, and in one operation. Monorail cranes also come in over this section of the floor from the passway connecting with the casting shop, taking the racks of pans, carrying crucible charges to the casters, and bringing out the cast plates and rods to the trimming shears from which they are loaded for removal to the various mills.

Seven 3-ton monorail cranes are used on the I-beam runways shown in the casting shops and passways. In the metal storage building two 3-ton and one 5-ton bridge cranes operate on a runway extending over the entire length of the building. The operators' cages on these cranes are supported under the center of the bridge in order that the operator may have an unobstructed view of the whole floor area under him. All the cranes carry on the lower block of the hoisting tackle two hooks rigidly attached to a beam with the hook openings facing in one direction and the distance between hooks is universal with and the same as the distance between the bails, or handles with which they engage to lift the various racks, baskets, or slings. These hooks are all in the shape of a gable end or triangle and by handling the loads always approximately under the crane runway, the crane operator is enabled to lower the load, disengage the hooks and lift and remove the load without any assistance from any one on the floor.

RECOVERING METAL FROM ASHES.

The triangular shape of these bails also causes the hooks, when lifting, to center automatically over the load and pick it up so that it has no list. The end of the hook beams register with guides on the cranes when lifted so that the load remains in line with the crane at all times as it travels under switches and turns and through the narrow runways where a cross position of the load might cause interference with building members, other cranes, etc. The cranes handling coal and ashes travel through the center of the casting shops between the two lines of fires and molds and pass through the south passway and the south end of the metal storage building to the ash reclaiming plant and coal hoppers. These cranes handle sheet steel coal and ash buckets previously described, in the same way that those just described handle the metal racks and slings.

When the ashes are removed to the ash reclaiming plant by the cranes, they are dumped into a hopper in the same manner as the coal is dumped into the casters' coal bins. From this hopper they are conveyed by chutes into crushers of the revolving bin type, where they are wet and crushed and then passed on to a Huntington mill and wash tables of the usual type. The waste ash or tailings are carried away with the water into a pit at the north side of the building. The solid matter falls to the bottom of the pit and the water overflows at the top and is drained off. This pit is at the end of the spur track shown at the west side of the coal storage pocket, and when the pit becomes filled with the tailings a locomotive crane in use about the mill yards comes up on the spur track with an empty car and cleans out the pit, removing and dumping the tailings about the yard in various places for filling purposes.

FINAL DISPOSITION OF PRODUCTS.

As is evident, these shops have not inaugurated any especially new or startling developments in the casting of brass and copper rods and plates. Their principal value lies in their labor saving methods and appliances. The use of individual motor drives, monorail cranes and the grouping of apparatus to produce the continuous movement of material in proper consecutive order with as little expenditure of energy or labor as possible is the underlying principle of their design.

Charcoal is unloaded from the track at the west side of the coal storage, which is the same track used to remove the tailings. Coal is unloaded from the track to the east of the coal storage bin and stored therein. Copper ingot comes in on the west track in the metal storage building and is unloaded directly into the stor-

age bins. Spelter comes in on the same track and is unloaded directly into the bins, some of it broken to the proper sizes in the process of unloading. Scrap comes in on the west track principally, but some times on the east track, and is unloaded on the floor and

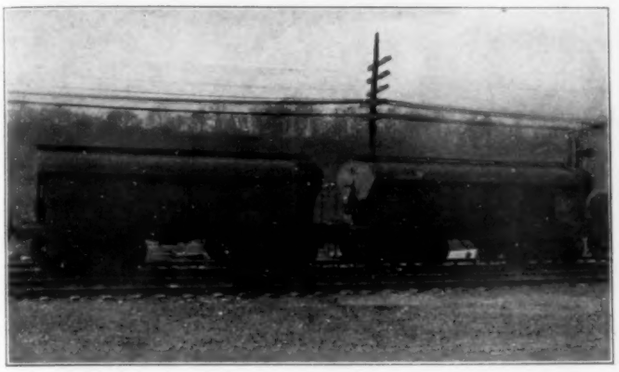


FIG. 4. TYPE OF CARS USED BY THE COMPANY TO TRANSPORT METALS.

cabbaged and delivered into the storage bins. The metal is weighed out of the storage bins into the pans passing on the conveyor, as before described, the pans carried by the cranes to the casting floor, the metal melted and cast, and as it is removed from the molds it is loaded on to the carriers which the cranes take up and deliver to the trimming shears, from which it is again loaded on to the carriers and conveyed by the crane to the trucks or railway cars on the east track in the metal storage building, from where it goes to the various mills.

That shipped out of the yard is loaded into steel cars owned by the company. These cars are short double-truck steel cars with sides about as high as a coal carrying gondola. They are equipped with steel covers made in two parts which, when closed, cover over the top of the open body completely and provide a walk over which train hands may pass. The two halves are supported at each end and connected by gearing in such a way that a man standing on the end foot board of the car and manipulating a crank, or lever, either opens or closes the covers over the top of the car, somewhat like the opening and closing of the two halves of a clam shell type coal bucket. When the car is opened, the two halves of the cover pass from the centerline of the car away from each other and over and down outside the sides of the car. The means provided for operating the covers is clumsy and slow and a man-killing operation, but provides a secure protection of the car contents against either theft or observation when it is outside the mill yards. The company's switch engines deliver these in common with their other freight cars to the railroad yards where they are handled by the railroad company to the other mill yard to which they may be consigned.

THE MICROSTRUCTURE OF GERMAN SILVER *

By O. F. Hudson, M.Sc., A.R.C.Sc. (Birmingham University).

The white and ductile alloys of copper, nickel, and zinc which are known as "German Silvers" are of somewhat widely varying composition, and are made in a number of different qualities, the most usual of which contain about 55—60 per cent. of copper, 15—20 per cent. of nickel, and 20—30 per cent. of zinc. The general properties and microstructure of this class of alloys are described by Law,† who points out that, like almost all commercial ductile alloys that are rolled and drawn, they consist essentially of crystals of one substance only, namely, a solid solution. Also he has shown that the microstructure of German silver closely resembles that of the brasses which consist of the α solid solution of the copper-zinc series, and these observations are in agreement with the results of Tafel's‡ investigation of the ternary system copper-nickel-zinc.

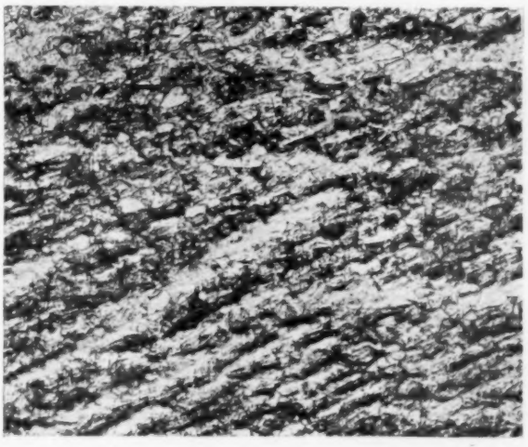


FIG. 1. AS ROLLED × 100 DIAMETERS.

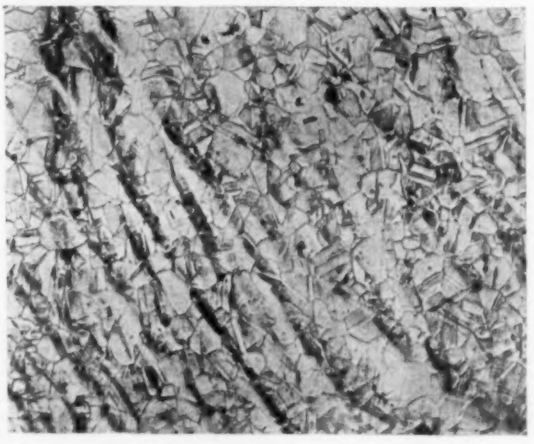


FIG. 2. ANNEALED FOR ONE HOUR AT 700° C. × 100 DIAMETERS AND REDUCED.

In order to study the effect of continued annealing on the crystalline structure of German silver a number of samples were supplied to the author by Mr. G. A. Boeddicker. These samples were all of the same quality and of the following approximate composition:—

*Paper read at March meeting, Institute of Metals, London, England.

†"Alloys and their Industrial Applications," by E. F. Law (Griffin).

‡V. E. Tafel, "Metallurgie," July, 1908, vol. v., p. 413.

	Per Cent.
Copper	58.0
Nickel	18.5
Zinc	23.5

The samples had been annealed under ordinary works conditions at a temperature of 700° C. for varying lengths of time. Two series were supplied, the first having annealing times of 1 to 10 hours and second from 24 to 72 hours.

FIG. 3. ANNEALED FOR 10 HOURS AT 700° C. × 100 DIAMETERS.

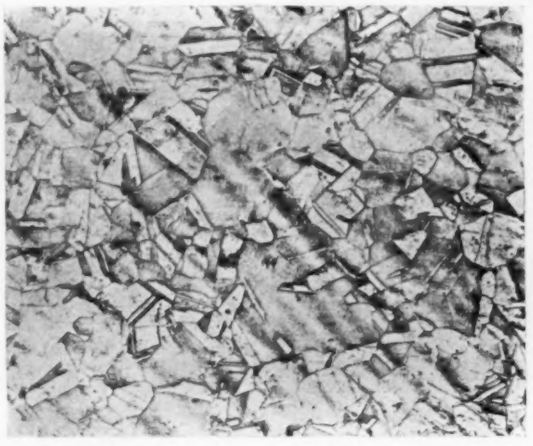


FIG. 4. ANNEALED FOR 24 HOURS AT 700° C. × 100 DIAMETERS.

Typical microstructures* of the cold-rolled and annealed samples are shown in Figs. 1 to 6. These show that the usual crystalline growth takes place on annealing, but it will also be observed that the cold-rolled alloy still shows very distinct signs of the original cored structure of the cast material. The "cored" structure is still in evidence after prolonged annealing, as is shown by Fig. 5, which is the microstructure of the sample after 48 hours' annealing at 700° C. After 72 hours' annealing at 700° C. the alloy is practically homogeneous (Fig. 6), although faint traces of the "cores" were observed even in this sample when very slightly out of focus under the microscope. The conclusion that the light and dark shading observed on the etched surfaces of Mr. Boeddicker's specimens was due to the persistence of the original "cores" of the crystals of the cast alloy was confirmed by experiments with an alloy of similar composition cast in the laboratory. The alloy was cast in a small strip mould, and the casting, 7/32-inch thick, was rolled, annealed by heating to about 700° C. for a few minutes, and rolled again to give a strip ⅛-inch thick.

(To be continued.)

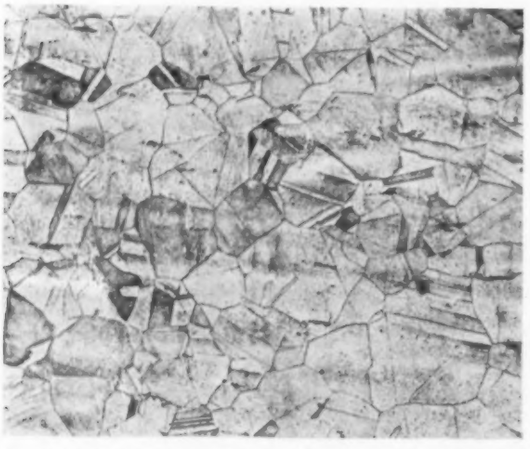


FIG. 5. ANNEALED FOR 48 HOURS AT 700° C. × 100 DIAMETERS.

FIG. 6. ANNEALED FOR 72 HOURS AT 700° C. × 100 DIAMETERS.

*The specimens for microscopic examination were prepared as follows: The surfaces were filed and rubbed on emery-papers in the usual way, then lightly polished with "Globe" metal polish, and finally rubbed on wet parchment on which was spread some freshly prepared magnesia. The specimens were then dipped in a strongly acid solution of ferric chloride for a few seconds, lightly polished with magnesia, and again treated with ferric chloride, these operations being repeated if necessary.

TESTING ALUMINUM WELDS.

According to Otto Nicolai, a German inventor of Bonn, the soundness of aluminum-welded joints in wire or manufactured articles. All that is needed is to put it in water, and if bubbles of gas are seen within the space of forty-eight hours, this is a sign that the welding was badly done, and in such case the sample will be sure to break down sooner or later. The gas given off is hydrogen. He claims that a bad joint will give out by a fourteen days' immersion in water, as the metal disaggregates, while in the air the time is considerably longer, six months or more before breaking down. Damp air causes the failure to take place in less time, as may be expected. For domestic utensils there is great danger of the aluminum wearing off and taking the shape of cutting scales of metal, and when these enter the digestive organs they are likely to do much damage.

RECOVERING FULL VALUE FROM PLATINUM SCRAPS AND FILINGS

SOME INTERESTING FACTS REGARDING THIS MOST VALUABLE METAL AND A DESCRIPTION OF A METHOD FOR ITS SEPARATION FROM GOLD AND SILVER, OF PARTICULAR VALUE TO THE MANUFACTURING JEWELER.

BY CHRISTOPHER GAUS.*

GENERAL FACTS.

Pure platinum is white, with a greyish tinge. It is as soft as copper, malleable and very ductile. At a white heat it can be welded, but is fusible only with oxyhydrogen blowpipe or by the eletcric furnace. The specific gravity is 21.48 at 18 degs. C. The melting point is far higher than that of any metal known in the history of manufacturing. Most metals volatilize at the temperature in which platinum starts to melt. Air has no oxidizing action upon it. It is scarcely acted upon by any single acid. Aqua regia is the only acid mixture that will attack it. Unlike all other metals which are used in the arts, it remains absolutely impervious to the corrosive action of oxygen or any other gas. Its untarnishable brilliancy defies the elements.

Chlorine, bromine, Sulphur and phosphorous combine directly with platinum. Iridium is its only appropriate alloy and the addition of 10 per cent. iridium makes platinum harder than 14 carat gold. Iridium is worth $65 an ounce. Probably no metal has experienced more fluctuation in value than platinum. In 1874 it was $7 an ounce. In 1907 the price was $35 an ounce. At present date the price for pure platinum is $46 an ounce, and $50 an ounce for iridio-platinum suitable for jewelry making. Platinum weighs 58 per cent. more than 14 carat gold and is about three times its value. Pure gold is worth $20.67 an ounce.

VALUE SAVED IN PLATINUM.

The writer of this article was called upon a year ago, in his capacity as foreman of an up-to-date New York City jewelry shop, to save the expense of sending platinum scraps and filings to the refiners. The reason of sending was the extreme heat necessary to melt platinum, and the smaller shops did not have the facilities. The refiner would give credit for the scraps and filings and his credit would amount to a very great loss in a month. This article is written to give all jewelers, dentists and numerous other trades the information of how the credit was increased nearly 100 per cent. by melting the scraps and alloying the filings in the shop at small cost. The saving can be estimated when you read the figures of the use of platinum in an ordinary jewelry shop, as platinum jewelry is in very great demand at present.

The shop made up 400 pennyweight a month, and prices at present are $2.30 a pennyweight. Returning scrap to refiner brought $2.10 a pennyweight, showing a loss of $.20 on each pennyweight. The filings, which had a very small trace of gold mixed with them, returned to refiner brought $1 a pennyweight. The loss, it can readily be seen, amounted to at least $50 a month. The writer set to work to eradicate this loss. Heat averaging 4,000 degs. F. was necessary, and the furnace in the shop in which gold was melted was not half powerful enough. Electric furnaces run into considerable money and trouble, and after numerous interviews with manufacturers of electric furnaces, etc., he discovered an outfit that cost $9.55 to install.

THE NECESSARY APPARATUS.

The New York Calcium Light Company delivered one tank of oxygen and one tank of hydrogen, which cost $2.25 for both. Six feet of half inch rubber tubing was bought at a cost of $.65. The tubing was cut in half and attached three feet to each tank. One pair of black eye-glasses are needed which cost $.15. Went to numerous makers of blowtorches and at last got an improved up-to-date affair for $6.50. Total expense, $9.55.

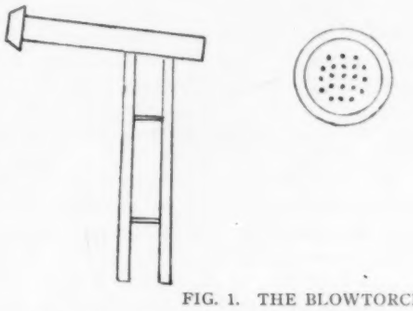


FIG. 1. THE BLOWTORCH.

The blowtorch, Fig. 1, must have a heavy head, as there is where the danger lies. The force of the oxygen being so great as to blow off its head, if not strong enough. The head is brass one inch thick, about eight inches long, with a quarter-inch hole running through, connecting with the two tubes which are connected by rubber tubing to the tanks. A cap made of iron is screwed on front of head, which has a dozen fine holes through which the flame is forced by the pressure in the oxygen and hydrogen tanks.

Attach the two rubber tubings to torch, and it is very important to have the oxygen tube behind the hydrogen one, as the oxygen is the power and the hydrogen the fire. Then take a five-inch triangular sand pot and break off the top, so as to leave a cone,

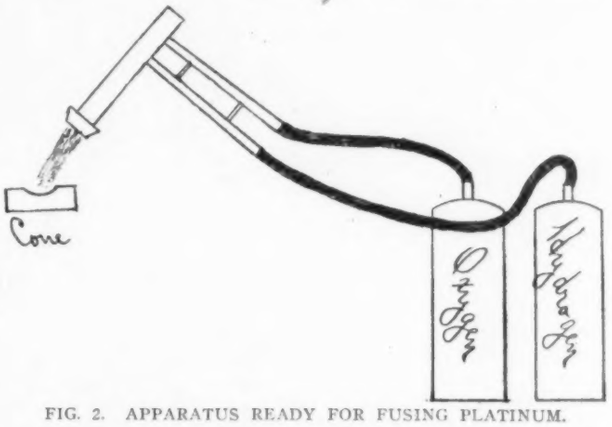


FIG. 2. APPARATUS READY FOR FUSING PLATINUM.

then with the pair of black glasses you are ready. (Fig. 2.) Two ounces have been melted at one time by this method and experience will teach the operator on how much power to turn on from the tanks. About three minutes are needed to melt the above amount, and it is difficult to believe you have generated 4,000 degs. F.

It is very important to wear black glasses, as the flare is very bad for the eyes. The first time the writer used the affair, he did not wear any glasses and

*With Wallace W. Hurd, manufacturing jeweler, New York.

result was he could not see plainly for at least fifteen minutes. A small amount of borax should be used in melting the scraps and after melting the platinum should be boiled out in sulphuric acid to remove the borax. The tanks should be shut, screwed tightly when not in use.

The disposal of the filings is a rather simple process. Extreme care must be exercised in keeping everything clean. At least 20 to 50 pennyweights can be assayed at one time. Of course, a larger amount could be handled, but then you would have to get some of the expensive vats and tools of the refiner, and wind up with an electric furnace, which would cost from $100 up. The tanks of oxygen and hydrogen will melt about 400 pennyweight, and then there will be the expense of $2.25 for new tanks. Platinum does not lose weight by remelting and every grain can be accounted for.

The first thing to do with the filings is to burn them clean to remove dirt of all sorts. Then run a magnet through a few times to remove any iron or steel. It is a good idea to then weight and see how much clean metal you have, as the weight will come out pretty near exact in platinum and gold.

THE CHEMICAL SEPARATION.

The chemical part then begins, that of separating the gold and platinum. Silver was never mixed with these filings, only the small part of alloy in the gold, and we never bothered recovering the small amount. But it can be recovered after the gold and platinum.

Mix a bath of aqua regia, consisting of 2½ parts hydrochloric acid to 1 part nitric acid. The filings are put in a shallow porcelain dish and only covered with the aqua regia. The dish is put over a very small flame or hot sand. This should be done under a hood, connected with a chimney, as the vapors are highly injurious and the operator can be quickly overcome with the fumes. The dissolved metals form chlorides of gold and platinum, and when there is much metal the liquid becomes dark and thick. The liquid should be carefully poured off into another dish and new acid added to the metal, always being careful to pour only clear liquid off, not disturbing the metal and residue. When all the metal is dissolved, pour the dark liquid into the second dish, then add a little water to residue in the first dish, stir, let settle, and pour off again to the second dish, repeat this till washings become colorless.

The sediment, if any, is chloride of silver, and is laid aside and melted up later. The dish of chlorides of gold and platinum is put again over a small flame and evaporated until the liquid is dark brown and thick, nearly dry, then water is added, enough to make the liquid a rich, dark orange color. If too pale, too much water has been added, and if too dark, not enough. In the latter case, some gold will stay with the platinum. In the former case, some platinum will stay with the gold. Then add a saturated solution of chloride of ammonium, which causes the formation of the double chloride of platinum and ammonium, which settles to the bottom, leaving the gold in solution. The saturated solution of ammonium chloride (or sal ammoniac) is formed by dissolving in water as much of that chemical as the water will take up.

Continue adding this solution to the rich, dark orange colored liquid as long as the precipitate is formed, stir well and let settle. When it all settles to the bottom of the dish, carefully pour off the liquid which contains the gold into a large transparant glass jar, so that the progress of the operation can be seen. Over this jar place a smooth board, with a hole in middle, large enough to hold firmly a large funnel. Into funnel fit a folded filter paper and carefully pour the remainder through the filter paper. When all has filtered, the gold solution is in the jar, leaving the platinum precipitate on the filter paper.

Some of the platinum precipitate may cling to the dish from which the solution is poured into the funnel; if so, wash out with the sal ammoniac solution, as pure water would dissolve the platinum chloride.

When all has been filtered, take the filter paper containing all the platinum and dry. Put the paper and all in a clean crucible and gradually heat until it becomes red hot. This operation burns off not only the paper, but all the ammonium and chlorine, leaving pure platinum, in form of platinum sponge, a porous black mass, which, with a small amount of borax, gradually heated, so that the borax will make it cling together, can be melted by the oxyhydrogen blowpipe. And it is then ready to be used as new pure platinum. The liquid poured off the precipitated platinum chloride, and also the filtered part and the washings, contains the gold, which is dissolved in the form of chloride and must be precipitated.

For this purpose make a saturated solution of ferrous sulphate, commonly known as copperas, and add to the solution. This causes the gold to separate in a state of absolute purity, in the form of a chocolate brown powder. This should be allowed to stand over night in order to let all the gold come out of solution, which takes some time. Filter as before and dry the filter paper and put in clean crucible with a small amount of saltpetre, which burns out any impurities, heat till the gold is partly melted, add a small piece of borax, melt it into a button, and it is ready for use. Do not throw away the remaining solution, as a trace of gold may remain, which can be recovered by putting into the liquid a small sheet of copper; let it stand a week, and a small amount of precipitated gold may be found at the bottom. The operation of everything described in this article is very simple, and when the saving is counted up in a year, it will be found to amount to considerable money.

MONEL METAL'S NON-CORROSIVE QUALITIES.

Recent experiments made at the laboratory indicate that Monel Metal possesses about the same resistance to corrosive action as the better-known bronzes, while it had the additional advantage that it presented the least change in appearance as result of the corrosive action. Specimens of several bronzes, Monel Metal and steel were weighed and embedded in rich earth which was kept wet for six months by periodical additions of very dilute solutions of corrosive salts. At the end of the test period all of the specimens were taken out, scrubbed, dried and weighed to ascertain the comparative loss from corrosion. The results were as follows:

	Per cent. loss.
Phosphor	0.09
Tobin bronze	0.11
Monel Metal	0.12
Parson's manganese bronze	0.12
Muntz metal	0.33
Steel	1.04

Another test of the same kind under somewhat different conditions, but the same period, gave about the same relative results.

NICKEL PLATING

By H. J. Ter Doest.

At this time when there is so much written about new methods, and new nickel salts, one would think from the reading matter on the subject, that it was impossible to do good work with the so-called old-style solutions made and kept up with double sulphate of nickel and ammonia. Now, as the writer has done that very thing for twenty (20) years before other things were thought of for keeping up a nickel solution, it might interest some of the readers of The Metal Industry, to have a definite way of doing same described, and the reason for failure. As is familiar to every one. The solution is made by dissolving 12 ounces of double nickel salts to each gallon of water, and maintained by adding the double salts from time to time as needed. Now the method of adding salt is not to dissolve it in water and then add it to the main solution, as that is liable to make it over concentrated and crystallize out on the anodes, and stop them from dissolving. By placing the salts in a very fine mesh wire basket (previously heavily nickel plated), and hanging it on the work rod over night and let it take up as much as it will, and you will not have any trouble with the salts crystallizing out.

Now the greatest trouble with using a double salts solution arises from overcrowding work in the tank to such an extent that your anode cannot keep up the metal content of your solution, and you soon have nothing left but sulphate of ammonia instead of double sulphate of nickel, and ammonia. The nickel deposited under those conditions, while very white and beautiful, peels off before any considerable deposit has been obtained. Nothing can be done with a solution in this condition, as it will not dissolve any double salts, even if it only stands 5 deg. Baumé unless we get away from the double salts idea. But solutions have been run indefinitely by not overcrowding. As the present trend of business is to overcrowd, one can not always keep a solution of this sort self-sustaining. But a solution that is run out of metal can be put in good condition again by adding single salts (sulphate of nickel) put in as above alone, and if not too far gone, will at once plate satisfactory again.

Again, if too acid when the single salts is added, it is good policy to add a small amount of moist carbonate of nickel, to neutralize the solution instead of ammonia; as the latter again starts the process of getting too much sulphate of ammonia in your solution. Sometimes you may have to run the solution from anode to anode for a few hours, if it gets too bad before adding single salts. To make the carbonate of nickel, precipitate it from sulphate of nickel with carbonate of soda and wash the precipitate carefully, the same as carbonate of copper is made from sulphate of copper. After adding the single salts, and getting in good working condition, you may add double salts again, as long as it will dissolve out of the basket hung on the work rod over night; as it is impossible to get too much double salts in in this way, for it will not dissolve. But when the solution gets down to 5 deg. Baumé, and double salts do not dissolve, it is time to give it a little single salts again, and you will find that, after putting in the single salts, it will dissolve the double salts again until it reaches 7 deg. or 8 deg. Baumé; depending on the temperature of solution, which should never fall below 65 deg. F., at which it will stand about 7 deg. Bear in mind when double salts will not dissolve, when the solution is 5 deg. or 6 deg. Baumé, single salts will.

With a solution of this kind the writer is doing work every day that stands up under the press, to form a bead after plating, also cutting and machining of various kinds. Also plates nickel over nickel successfully as part of our regular work, and as to time, I have plated a tank full of work in two (2) minutes, and it stood nickel buffing, too. To say, however, that I am doing work in that time is not so, as it is as inconvenient as to leave it in two (2) hours, for you can not handle the work fast enough. This is only what can be done if need be, and what is more, the work comes out as bright as if nickel buffed.

But as I do not understand any method whereby work of that kind can be dried without stains, we nickel buff most work as being cheaper than wiping with a cloth, for the work is fine brass work and can not be tumbled or any other saw-dust method used, as that would leave too many scratches. Again, in a solution of this kind, work does not burn or otherwise discolor unless too much current is used for the work being done. It can be rushed as much as desired, for if you crowd the work, you can crowd the current, and get the work out as fast as you like. But in this case it will take more single salts to keep your solution fit, as you will take more nickel out of solution than will dissolve from the anode.

Under ordinary working, the metal will dissolve as fast as deposited, and the deposit will be at about the rate of 1.1062 grams or (17.071 grains) per ampere hour.

The method of observation being under regular working conditions. Carefully weigh one wire of work and place it in with a tank full of work, and place an ammeter between wire and work rod. Note the current and time. Multiply ampere hours by 17.0712, then weigh the work carefully again and you can see the difference between the theoretical amount that should deposit, and what actually does, and you will find there is very little difference.

I tried work that way several times and came out with the following results: Estimated weight deposited, 4.24 grains; actual weight deposited 4.06 grains, plus what was on the wire.

Again I carefully weighed pieces and put in with regular work; noted current and time of the whole tank of 360 pieces and one piece figured 1.51 grains and weighed 1.46 grains, neglecting what was on the wire. Another figured 1.35 grains, weighed 1.35 grains; still another 2.13 grains, weighed 2.24 grains, showing it is very impractical to get the exact rate of deposit as the last one shows more than the theoretical deposit, which is plainly due to miscalculations, likely caused by current variations.

From time to time make a test of the solution, and I find when it works best it is about 6 deg. Baumé and 65 deg. F. and contains about 1½ ounces of nickel per gallon, according to the method of G. Bernard Brook, published in The Metal Industry, May, 1912, with the following modifications for his silver dish, gold lined. I take the end of an old tin can and only use it once and throw it away. Made 3 assays of same solution this way, and found the greatest difference .05 grains near enough for all practical purposes.

Also, I take 37.8 C. C. of solution, as that is just 1/100th part of an American gallon, or 45.36 C. C. = 1/100th of an Imperial gallon, using a burette for measuring in place of pipette. When the solution is in that condition, it is at its best, and can carry 10 amperes per square foot of cathode surface, which makes it deposit

very rapidly; but if there is more nickel (or less) in solution, it seems to lose the quality of carrying the above amount of current per cathode surface without burning, and consequently cannot be worked so fast, and that is where most platers make their mistake—having too little nickel in solution as can be seen in almost every nickel plating establishment, by the size of the dynamo employed. As they will have a 1,000 ampere dynamo in almost every place, where they deposit about 500 pounds of nickel or less per year, and as one ampere deposits 17.0712 grains of nickel per hour, 100 amperes for 10 hours and 300 days will deposit a little over 730 pounds of nickel; showing their cathode efficiency to be very poor, caused principally by solution being too poor in nickel. While having too much nickel does not allow as strong a current to be used without burning the work, but lessens the amount of nickel taken from the anode or reduces the anode efficiency.

Also keep the work as far as possible from the anode, as having the work too close to the anode will soon rob the solution of metal and is likewise the best possible promoter of pitting. It is a very good policy to have a limit for the current used, according to the anode surface in solution, or you will not keep your solution balanced. Use current according to the amount of work, but not over your limit, as that is the best way to do away with the overcrowding of work and getting good results uniformly from day to day. Keep your solution nearly self-contained. A nickel solution ought to be kept in good condition with as much salts as it will take to make it for one year. Use 98-99% anodes for silver-white work.

OXYGEN IN BRASS*

By Professor Thomas Turner, M. Sc.**

I.—OCCURRENCE OF OXYGEN.

It is generally recognized by practical men that brass may be spoiled under certain circumstances as a result of oxidation. For example, brass which has been poured at a lower temperature than usual is apt to be inferior, and this is attributed to the entanglement of oxide of zinc in the metal owing to its viscid or plastic character. It is believed that the inclusion of oxide of zinc in this way may be one of the causes which occasionally lead to rapid and irregular corrosion with condenser tubes. When sheet brass is annealed in a reducing atmosphere, dezincification may take place, owing to the volatilisation of zinc; but if the atmosphere is oxidizing, a certain amount of oxide of zinc may also be produced in the alloy and rottenness results. The conditions under which such results are produced do not appear to be well understood, while the manner in which oxygen acts is generally a matter of doubt. The mode of occurrence, influence, and estimation of oxygen in brass is therefore of considerable practical interest.

It is well known that cuprous oxide is soluble in molten copper, with which it forms a eutectic with 3.45 per cent. of Cu_2O. References to standard researches on this subject will be found in the paper recently contributed to this Institute by Mr. R. H. Greaves, B. Sc.† The copper oxide eutectic is visible under the microscope and can be very plainly seen with samples of copper, which are otherwise pure, though the eutectic becomes more or less obscured as the proportion of impurities increase. Zinc oxide, on the other hand, does not appear to be soluble in zinc, nor can either cuprous oxide or zinc oxide be detected by any characteristic appearance in brass of ordinary good quality.

The presence of oxygen has not been recorded in the gases extracted from brass when heated in a vacuum.

The question therefore arises as to the form in which oxygen can exist in brass, assuming it to be really present. In order to ascertain whether copper oxide can exist in the presence of zinc, it is only necessary to perform a simple experiment. If powdered black oxide of copper be mixed with finely divided zinc in equivalent proportions, and heated in a test tube, it will be found to readily react with the evolution of heat, and the product consists of metallic copper and oxide of zinc. The converse experiment of heating zinc oxide with finely divided copper has been carefully tried in my laboratory by placing the mixture in a porcelain boat in a vacuum and heating to the melting point of copper. If any reduction occurred there should be a corresponding loss of metallic zinc by volatilisation, but our experiments show that no appreciable loss occurred. Hence, though zinc reduces copper oxide to metallic copper when the materials are heated together, copper does not reduce oxide of zinc.

From this it is evident that copper oxide cannot possibly exist dissolved in brass, as it would be immediately decomposed when the alloy was melted. The only oxide which can exist would appear to be oxide of zinc, and this might conceivably be either in solution or in suspension. So far as I am aware at present there is no evidence to prove that oxide of zinc can dissolve in brass any more than that it can dissolve in zinc itself; nor is there any miscroscopic evidence of the separation of oxide of zinc in brass either as a eutectic or in any similar form. We are driven, then, to the conclusion that any oxide of zinc that may be present is mechanically entangled, and when it has any effect upon the microscopic structure it is represented merely by minute holes in which it originally occurred, but from which it has been removed during the processes of polishing and etching.

II.—ESTIMATION OF OXYGEN.

The usual method of estimating oxygen in copper is that introduced by Archbutt,* in which the sample is heated in a stream of hydrogen with suitable precautions, and the oxygen is determined by loss of weight of the copper. Some analysts prefer to weigh the water produced by the reduction of the copper oxide. The "difference" method is simpler and quite satisfactory so long as there are no volatile impurities. The temperature required is only a low red heat. Oxide of zinc, on the other hand, is infusible and non-volatile in an oxidizing atmosphere at ordinary furnace temperatures. The temperature of reduction of ZnO is high, varying somewhat with the pressure and with the nature of the reducing agent. It is approximately 1,000 deg. C., or. say, 50 deg. to 100 deg. above the boiling point of zinc. Hence any oxygen present as oxide of zinc cannot be directly estimated by loss of weight on heating in hydrogen, as a quantity of zinc would be volatilized when the oxide was reduced. Attempts have therefore been made to determine the oxygen in brass by means of the weight of water produced on heating the alloy in hy-

*Paper read at London meeting Institute of Metals, September 25-26.

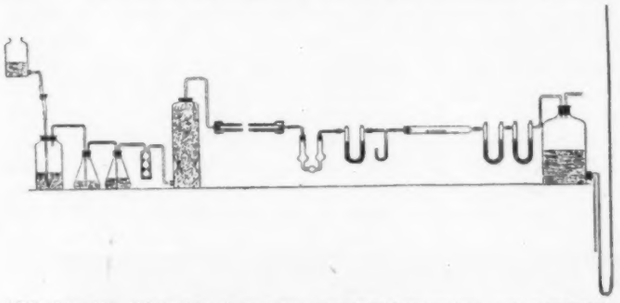
**University of Birmingham.

†Journal of the Institute of Metals, No. 1, 1912, Vol. VII., p. 218.

*L. Archbutt, Analyst, 1900, Vol. xxv., p. 253; 1905, Vol. xxx, p. 385.

drogen. For this purpose a drying tube has been employed and weighed before and after the experiment.

As there was reason to believe that such a method was unsatisfactory, the reaction has recently been reinvestigated in my laboratory by Mr. R. W. D. Nevill, B. Sc. The apparatus employed is shown in Fig. 1. It will be seen that hydrogen, which was obtained by the



APPARATUS NEEDED FOR THE DETERMINATION OF OXYGEN IN BRASS.

action of dilute hydrochloric acid on zinc, was purified by being passed successively through lead acetate, silver nitrate, and caustic soda. In order to remove any trace of oxygen the gas was then passed over heated copper gauze and through two drying tubes to absorb any water produced from the trace of oxygen. The hydrogen then passed through a hard glass combustion tube, the end of which was drawn out so as to avoid the use of a rubber bung connection with the drying tube and aspirator. The material to be tested is placed in a porcelain boat and is heated to redness with the aid of a small combustion furnace. The hydrogen, after passing through the combustion tube, was dried, and any increase of weight of the drying tube carefully noted.

The second calcium chloride tube shown in the figure is a guard tube to prevent diffusion from the aspirator. The aspirator is furnished with a water manameter which is graduated in half-litres. By allowing water to enter through the tube from the water top, or by drawing water through the bottom tube, the pressure in the aspirator can be normalized, and thus the quantity of gas passed can be read from the graduations. Blank experiments were first conducted in which hydrogen was passed through the apparatus so as to clean out any air, and then four litres of hydrogen were passed through the drying tube, which was always weighed when full of hydrogen.* The weight of the drying tube was found to be the same after the experiment as before, thus showing that the drying tubes were effective. In order to test the hydrogen for any trace of oxygen some copper strip was taken and was first heated in a glass tube in the hydrogen for about six hours to eliminate the whole of the oxygen originally present in the copper. A weighed drying tube was then inserted, and four litres of hydrogen were passed, after which the tube was removed and again weighed. As a result a regular increase of 0.0026 gram was recorded. This increase was apparently due to a small quantity of oxygen not removed by the copper gauze. A plug of platinized asbestos and a further length of copper gauze was then introduced, when it was found that four litres of gas only caused an increase in weight of 0.0002 gram in the drying tube, and this was considered satisfactory.

Some brass turnings weighing 9.2203 grams were then substituted for the copper strip, being placed in a porcelain boat in the combustion tube. On expelling the residue of air and heating the brass turnings for ninety minutes in a slow stream of hydrogen, it was found that there was no increase of weight in the drying tube. There was, however, a ring of oxide of zinc formed at the edge of the zinc sublimate contained in the tube. These experiments showed that oxide of zinc might be in the metal in the heated portion of the combustion tube without any corresponding quantity of water being obtained. Experiments were next conducted with pure oxide of zinc, which was placed in the boat in the combustion tube, and heated to temperatures increasing up to 1,000 deg. C. It was found that there was no increase of weight of the drying tube, though a quantity of oxide of zinc was condensed on the sides of the combustion tube. The origin of this zinc oxide appears to be as follows:

The hydrogen reduces zinc oxide to metallic zinc which volatilizes together with the water produced by the reaction. The water oxidizes the zinc vapor as the temperature falls and reproduces oxide of zinc and hydrogen, the net result being that no water is carried away to be absorbed by the drying tube. This is in accordance with the observations of St. Claire Deville* and also of Dick.† The former observed that when zinc oxide was reduced by hydrogen, if the gaseous velocity was small, the zinc formed was nearly all reoxidized, but that with increased velocity of the hydrogen the proportion of metallic zinc obtained is greater. Mr. Nevill therefore proceeded to try experiments dealing with the effect of increased velocity of hydrogen, quantities up to one litre per minute being employed. Zinc oxide was heated in a porcelain boat to a high temperature as before. A considerable proportion of zinc oxide was reduced, and metallic zinc volatilized. The proportion of zinc was certainly much greater than with a slow stream of gas, but even with this excessively quick rate of passing the gas there was still a fringe of oxide on the sides of the tube.

It is, therefore, evident that no accurate determination of oxygen in brass can be made by adopting the methods which are suitable for copper. The volatilization of zinc from the sample when heated in hydrogen renders the loss of weight quite untrustworthy as an indication of the oxygen removed; while the secondary reaction whereby zinc vapor is oxidized by water vapor as they pass together out of the heated portion of the tube prevents more than a small proportion of any oxygen which is present from being absorbed as water by the drying tube. Methods of extraction of oxide of copper by digestion of brass turnings in ammonia are evidently quite untrustworthy, as there is reason to believe that copper oxide is not present in brass, and anything which is extracted is obtained merely as a result of errors in manipulation. A description of a simple and direct process for the accurate determination of oxygen in brass would be appreciated by many who are interested in the subject.

*Compare Greaves, Journal of the Institute of Metals, No. 1, 1912, Vol. VII., p. 235.

*Annales Chimie et Physicalische, 1855, 3rd Series, 43, p. 479.
†Percy's "Metallurgy," 1861, p. 535.

ACETIN.

Having had a number of inquiries as to the word "Acetin," which appeared in Oscar Hillman's article, "The Bronze Finishes," published in the April, 1913, issue of THE METAL INDUSTRY, we give below an explanation of the compound:

"Acetin is a chemical that is made by slowly boiling two parts glycerine and one part acetic acid for about 20 minutes, then allow to cool and bottle. It is used with good results on old oil paintings that show a tendency to crack or curl. It is also extensively used to remove the yellow stain from old celluloid piano keys and other articles made of white celluloid."—(Ed.)

HINTS ON BRASS FOUNDING

By W. R. Dean.

(Continued from January.)

THE FOUNDRY.

In laying out a new foundry or reconstructing an old one for economical production, there are a good many things to take into consideration. The old brass foundries were never laid out with any idea of economy or system, but put away off in some nook or corner and were given very little attention. Today all progressive managers look to the betterment of their foundries and are installing up-to-date equipment and methods. A modern, well lit, ventilated shop is a better investment by far than the old-time, poorly lit, slovenly run place, called a brass foundry. The men are better satisfied and are of a better class in the up-to-date shop, and do better and more work. This I know from actual experience. In a dirty, smoky, behind-the-times shop it is hard to get the better class of molders and harder yet to keep them. Only the drifters try these places when more help is wanted.

In laying out a brass foundry the plan depends on the class of work and the land available. The engineer designing a foundry should be on the locality for several days studying the conditions before laying out his preliminary sketch. When large work is made and land scarce, the gallery construction is good. If land is plenty, then all can be on the ground floor When the brass foundry is part of a manufacturing plant and all the work is small, the top floor of the building is the place, the casting starting at the top and going down until shipped. The men and supplies going up in elevators. If the foundry is large enough to warrant it, the floor below can be used for mixing the sand, etc., the sand falling down through grating situated where the men dump their work. The sand is carried to a mixing place by chutes from the grating. One of the main objects in having the foundry on the top floor is the ventilation. If the foundry is on the ground floor the smoke has practically no escape and the men are caused an inconvenience, especially if yellow brass is poured. With the top floor arrangement the zinc smoke easily escapes of its own accord if ventilation is planned through the roof, or by side lights. Often the foundry is on the ground, with few windows, surrounded by buildings shutting off what

TABLET MADE FROM METAL RECOVERED FROM U. S. S. MAINE.

One thousand tablets are now being cast in New York from metal recovered from the U. S. S. Maine, destroyed in Havana Harbor, February 15, 1898. These memorial tablets will be distributed upon application to patriotic societies throughout the United States. So far more than two hundred applications have been received in the office of the Assistant Secretary of the Navy. The chief condition in the distribution of the memorial tablets will be that the recipients pay the actual cost of production. The first shipment of the memorial tablets was made about April 1, when distribution began. The tablets were designed by Charles Keck, of New York, and are being cast by the Jno. Williams, Inc., Bronze Foundry, also of New York. There will be about five or six thousand tablets cast.

little light these would supply, and on dark days necessitating artificial light. The artificial light is usually very poor, with no overhead lights at all, only but small gas jets at each bench. These shops pay the foreman the smallest wages possible and expect him to do as good and as much work as the up-to-date shop. Usually these foundries are connected with plants paying no dividend, or else a very small one.

The time-keeping and cost system of a foundry should be of the very best, giving the foreman needed information at all times.

If the shop is a specialty shop or a jobbing foundry doing some specialty work, it should be equipped with molding machines of the latest and best construction. Even on large work the jar rammer is successful. The style depends a great deal on the class of work. Small work can be done on hand squeezers, or power rammers with lifting devices, while heavier work can be done with roll-over machines. The benches should be equipped with power rammers, the old tubs of old foundries have been done away with as taking up too much room and being inconvenient. A useful and convenient construction is two braces from the wall set just far enough apart for the cleats on the bottom boards of the bench flasks, and two more to hold the cope after the lift off. Instead of blowers, an up-to-date shop has air connections and hose hanging down over each bench for blowing surplus sand off the mold.

A well equipped foundry has a place for crucible storage, usually using the waste heat from the furnaces. The waste heat from the furnaces in an up-to-date shop is usually used for a good many different things, one of them being to heat the core oven. A room over the core oven where large cores are baked is a good place for crucible storage. I have seen a large plant put their crucibles in a room away from any heat, and cold and frosty throughout the winter, and wonder why they did not get more than 20 or 22 heats from a No. 35 crucible that should give 50 to 60 heats or more. The core department should be equipped with up-to-date tools, etc. A jar rammer is very useful for jar ramming medium and large bench cores. A core machine for making stock cores should be installed, and also a sand mixing machine. The sand mixtures vary in different shops, but give the same results. Several grades of sand should be carried in stock to be used in the different classes of cores; for instance the small core should be made of fine sand, while larger ones of a coarser sand to allow the larger amount of gas in a big casting to escape. In large cores ashes or some such coarse material should be used to fill in the center. The common core binders are flour glue, molasses water, linseed oil and its compounds, and the prepared compounds as glutins, Mills and Obermayer.

(To be continued.)

THE JOINING OF METALS*

By Alex E. Tucker, F.I.C. (Birmingham.)

(Concluded from March, 1913.)

THE OXY-ACETYLENE PROCESS.

A characteristic of the oxy-acetylene flame is that it indicates the correct mixture, for when the acetylene is in excess a small green cap appears over the inner cone of the flame. On reducing the oxygen there is a point at which the cap disappears. The right mixture is just at this point, and the effect is so distinct that when working with acetylene the workman has no excuse for not getting the right proportion. If temperature were the only consideration, the oxy-acetylene process would be used in all cases in the working of thin metal, but its use requires much greater skill than the lower heat of the oxy-hydrogen flame. Then, again, when a fixed acetylene generator is not available, the risk and danger of a portable generator is considerable, and in such cases for oxy-acetylene welding "dissolved" acetylene only should be used. On the other hand, this is very expensive, and the apparatus is heavy, and it therefore follows that the oxy-hydrogen method with its complete portability is very often to be preferred, because hydrogen can be obtained in the usual bottles, and thus forms a very convenient plant.

In welding metals other than iron, not only the melting point but the heat conductivity of the metal must be considered. Thus copper with its high conductivity and its low melting point can hardly be worked with the oxy-hydrogen flame. Indeed, for the same section as iron it requires a much more powerful oxy-acetylene flame. Brass, bronze, and, indeed, any metal, may be autogenously welded, and many require much less care than that for aluminum.

The conditions of success which apply to all welding with acetylene or other hydrocarbons are: (1) the use of pure gases; (2) the use of a metal rod of approximately the same composition as that of the work to be joined; (3) the thorough fusion of the inside surfaces before the additional metal is applied; (4) cleanliness of the parts, and when desirable the use of suitable dioxidizing and fluxing powders, such as charcoal and borax, and lastly, the use of a blowpipe capable of complete control in respect to size of flame and proportion of mixture. With extended experience in the autogenous joining of non-ferrous metals, it is to be expected that this method will replace ordinary brazing where quality of work is of the first importance.

THE USE OF ALUMINUM POWDER.

There is an interesting series of processes for the autogenous joining of metals, most of which are patented, which depend on the reducing power of aluminum. Anyone who has seen the application of the Goldschmit or Thermit process to the joining of the ends of tram-rails can hardly fail to be struck by its extreme beauty and simplicity. We have here a small steel foundry not much larger than a silk hat, from which the metal pours in a perfectly liquid state. As showing the great heat obtainable when aluminum powder is used for welding, it may be mentioned that if a wrought iron plate 1 inch thick is placed under the crucible, the liquid metal when tapped will burn a hole straight through it, leaving a fairly smooth edge. Experiments show that the heat of the molten metal approaches 3,000 deg. C., the temperature of a Siemens furnace being about 1,600 deg. C.

This Thermit process has been applied for the repair of ships' sternposts and other large fractures, and means have been adopted for heating up the fractured surfaces to the proper temperature before pouring in the cementing iron without damaging the clean metallic surfaces. This is done by building up the molding box around the fracture in such a way that it may act as a flue or chimney to an outside fire worked with a compressed air blast.

*From a paper read at London meeting, Institute of Metals, September 25-26, 1912.

which dries the sand mold and heats up the metal very rapidly. The presence of even a small trace of moisture in the mold gives rise to blowholes in the thermit iron, hence great care must be taken that the mold is as dry as possible. The repair of the sternpost of the German Lloyd steamer Friedrich der Grosse was effected in this way. The only doubtful point in the process is the possible formation of internal fractures or cracks, but it is stated that in all the tests of the results fracture has invariably taken place outside the welding region.

It is very probable that in point of strength most thermite welds are superior to those electrically made, because the volume of heat is greater if not more intense, and, again, there is less risk of the original surfaces being burnt or oxidized. The thermite metal can also be adjusted to carry reducing media, which would quite eliminate any oxidizing influences.

Thermite proved useful during the Russo-Japanese war, especially on the Russian side. After the first attack of the Japanese on the Russian fleet at Port Arthur several tons of thermite were forwarded to the Russian Government, and the speedy repairs of many of the Russian ships were due to its use.

COMPOUND SHEETS.

The manufacture of compound sheets of metal is very old; thus, years ago, capsules for bottles containing liquids intended for domestic purposes were made from a compound sheet of tin and lead. The tin was used to prevent any action of such liquids on the lead—lead being a cheap and ductile metal which could be easily folded over the vessel, and so made water-tight. Such compound sheets were made by passing a sheet of lead and tin together through hot rolls, when complete union of the two was effected. Another illustration of compound metals is that of French plating—articles such as steel blades or knives, or flat brass surfaces, were plated by placing a sheet of silver on each side of the article to be treated. The whole was then bound with wire and heated in a muffle or other suitable furnace until a union at points was effected, after which the surfaces were burnished to improve the union, the whole being kept hot. Such goods were not, however, very permanent, and in the case of iron and steel work this might be expected on account of oxidation.

In Sheffield plate, which is also made in Birmingham, such plating is done exclusively on copper or its alloys. An ingot of such metal free from defects is well cleaned and coated with a saturated solution of borax. A sheet of silver is then laid on one or both sides of the ingot, according to whether the work is for single or double plating. The amount of silver used is considerable—thus for single plating it varies from 1/24 to 1/30 of the total weight, while for double plating this proportion is preserved in the double plating—i. e., the sheets of silver are half the gauge. After adapting the silver, the surfaces are brushed over with a saturated solution of borax, and the work bound together with wire. It is then heated in a furnace till the borax begins to run. The heat is carefully watched to prevent the silver running completely into the ingot. The point at which the work should be drawn is that at which the silver is drawn down flat on the surface. The operation is complete when a layer of solder is formed between the silver and copper, hence the care required in watching the heat. After removal from the furnace the work may be rolled to any desired thickness if properly annealed between the passes. After annealing, the metal may be treated as a homogeneous material, and may be raised, spun, stamped, or otherwise worked.

Tubes or wire of Sheffield plate are produced as follows: A strip of silver is formed into a rough tube with an overlap; a red-hot copper mandrel is then inserted into this, and the overlapping edges of the silver are made to adhere by hammering and burnishing. This tube is then cleaned inside, and a sliding fit made of it over a copper rod covered with borax; the ends of this rod are roughly grooved in order to engage the sheet of silver better, and also to exclude the air. The whole is then heated to redness and burnished down, after which it is passed through dies or beading machines, as required.

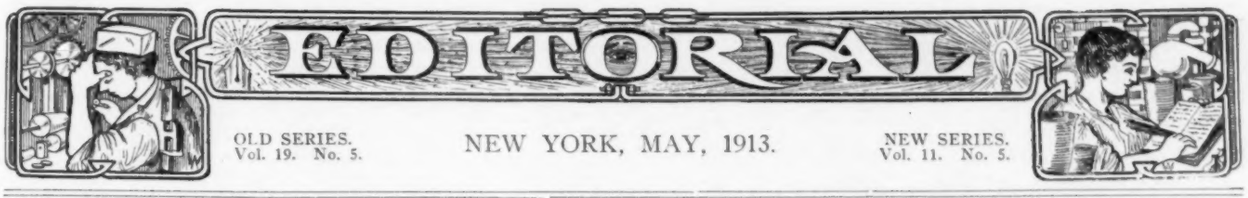
The last system of joining metals to which I desire to direct attention is the one in which the surfaces are not melted, but only slightly heated. During recent years the manufacture of compound metals, such as nickel and steel, copper and steel, aluminum and copper, has become of great practical importance, and many beautiful articles are now sold for domestic purposes. The nickel steel, copper steel, or nickeled zinc sheets may be obviously produced electrolytically, and afterwards rolled down to gauge, allowance being of course made for the ductility of the softer metal. But another method has lately been introduced in which sheets of different metals may be joined perfectly.

The manufacture of aluminum copper sheets illustrates the process, and further is interesting from a metallurgical standpoint. One method with which I am familiar is as follows: The copper sheet is pickled and cleaned. Aluminum powder is then brushed on by machinery, or by rubbing the surfaces with brushes or rollers of aluminum wire. A sheet of cleaned aluminum is then placed on such a surface, the two are heated and passed through rolls. The union is perfect, and hence the compound sheet may be subjected to stamping, spinning, etc., without any trace of lamination.

In the same way copper and steel, or almost any two or any number of sheets of different metals, may be compounded. The aluminum acts as a metallic adhesive. While rolling such sheets the top surfaces are often kept oiled to retard oxidation, and to obtain better finish. In view of these results, it would appear probable that the method could be modified in such a way as to produce ornamental designs by similar methods as those employed in the inlaying of wood already described, with the difference that two sheets would be employed and not three, on account of the impossibility of splitting the ornamental sheets, as is done with wood. Further, although I have not seen it done, it becomes possible by slight modification of the process to produce a design having several differently colored metals, thus giving effects similar to those produced by parcel gilding or plating.

A second method of making a compound sheet of different metals is that in which an oxide or sulphide of a metal which will alloy with both of the two sheets is taken and mixed with aluminum powder, and the mixture laid evenly between them. The whole is then heated to the fluxing point of the mixture and then rolled, and as the two sheets to be joined receive the full heat of the furnace in which the work is placed, it will be understood that the alloying of the metal from the mixture with the two surfaces of the sheets is very complete.

In another method, where still more heat is used, for the production of compound plate, say, of aluminum and copper, copper or other wire gauze is placed between the sheets, and the interstices filled as before with aluminum powder and flux, consisting of alkaline, chloride and fluoride. On heating the whole and rolling, the surfaces unite as before described, and probably more perfectly, because the gauze retains the flux better during the heating, and so does its work better, and is afterwards squeezed out by the rolls, while in addition there would also be the knitting or dowelling action of the gauze during rolling.



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THE METAL INDUSTRY

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THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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THE TARIFF ON METALS

We publish in this issue of THE METAL INDUSTRY a number of interviews which our correspondents in various parts of the country have had with some of the representative and prominent business men of the day. These interviews were sought for with a view of obtaining a resumé of the probable effect on the metal industries of the country, of the proposed tariff law, the provisions of which are now being deliberated upon by the United States Government. We must confess that we are a little bit surprised at the results shown in the reports. We had expected that there would be much more opposition to the reductions proposed. As it is, there are about an equal number of those who are not worried over the outcome, those who are indifferent, and those who are very much worried and fear disaster for their business and who threaten to either move their factories abroad or to import foreign goods.

What difference of opinion there is, however, lies in the class of material produced. The manufacturers of brass, bronze and kindred alloys are not at all concerned as to their ability to do the same amount of business as at present despite the fact that the question of labor is just as vital to them as it is to some other line of industry. The manufacturers of cheap jewelry, for which Newark, N. J., Philadelphia, Pa., Providence, R. I., and Attleboro, Mass., are great centers, are on the other hand most apprehensive and claim that the proposed tariff will "put them out of business." All this will happen, they say, "because of labor being so cheap in foreign countries!" It does not seem as though the difference in labor costs here and abroad would make much difference to the watch industry, judging from the experience of a New York Broadway merchant, who, a few years ago, according to report, was able to import American watches from abroad and still undersell the American manufacturer.

We cannot see how the tariff laws as at present proposed are going to radically upset the business balance of this country. Here and there some businesses probably will suffer, but might they not be founded too lightly and fall anyway? In a great many instances there are industries in this country that have become almost arrogantly independent through what might be termed over-protection. These concerns have therefore by reason of this security from competition become more or less dormant as to progress and the line of industry that they represent suffers. Competition is needed to bring out the latent strength. Waked up by the news of a new comer in their field every faculty is brought into play and new methods, devices and ma-

chinery are evolved in order to cheapen cost of production, and the consumer (at about the only period of the business game) benefits in lower prices. An exact exposition of what we mean by "competition stimulosis" can be had by reference to the mass of literature existing dealing with the Government attitude towards trusts and the interpretation of the Sherman law.

Chairman Underwood of the Ways and Means Committee in a statement accompanying the new Tariff bill introduced in the House of Representatives said:

"In its tariff revision work the committee has kept in mind the distinction between the necessities and the luxuries of life, reducing the tariff burdens on the necessities to the lowest points commensurate with revenue requirements, and making the luxuries of life bear their proper proportion of the tariff responsibilities. Many items of manufacture controlled by monopolies have been placed on the free list."

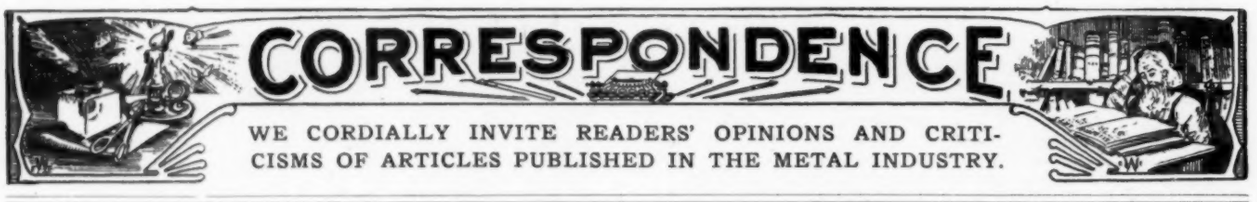
"Where the tariff rates balance the difference in cost of production at home and abroad, including an allowance for the difference in freight rates, the tariff must be competitive, and from that point downward to the lowest tariff that can be levied will continue to be competitive to a greater or less extent. Where competition is not interfered with by levying the tax above the highest competitive point, the profits of the manufacture are not protected.

"On the other hand, when the duties levied at the Custom House are high enough to allow the American manufacturer to make a profit before his competitor can enter the field, we have invaded the domain of the protection of profits. In the committee's judgment the protection of any profit must of necessity have a tendency to destroy competition and create monopoly, whether the profit protected is reasonable or unreasonable.

"Which course is the wiser one for our Government to take? The one that demands the protection of profits, the continued policy of hothouse growth for our industries—the stagnation of development that follows where competition ceases—or, on the other hand, the gradual reduction of our tariff to a basis where the American manufacturer must meet honest competition; where he must develop his business along the best and most economic lines; where, when he fights at home to control his market, he is forging the way in the economic development of his business to extend his trade in the markets of the world. The future growth of our great industries lies beyond the seas."

The following is a comparative list of the tariff as present existing and proposed upon items intimately relating to the metal industry.

Item.	Payne Rate.	Underwood Rate.
Aluminum	7c. per lb.	25 p. c.
Lead Bullion	2⅛c. per lb.	25 p. c.
Nickel	6c. per lb. to 25 p. c.	10 to 20 p. c.
Quicksilver	7c. per lb.	10 p. c.
Type Metal	1½c. per lb.	15 p. c.
New Type	25 p. c.	15 p. c.
Watch Movements	7c. ea. to 40 p. c.	30 p. c.
Zinc (pigs)	1⅜c. per lb.	10 p. c.
German Silver	25 p. c.	15 p. c.
Bronze Powder	12c. per lb.	25 p. c.
Copper Plate	2½c. per lb.	5 p. c.
Gold Leaf	35c. per 100.	35 p. c.
Tinsel Wire	5c. per lb.	10 p. c.
Gold and Silver Manufactures	45 p. c.	50 p. c.
NON-METALLIC SUBSTANCES.		
Boracic Acid	3c. per lb.	9c. per lb.
Citric Acid	7 c. per lb.	5c. "
Formic Acid	25 p. c.	1½c. "
Salicylic Acid	5c. per lb.	2½c. "
Tartaric Acid	5c. per lb.	3½c. "
Cream of Tartar	54c. per lb.	2½c. "
Sodium Bicarbonate	⅝c. per lb.	¼c. "
Borax (refined)	2c. per lb.	⅜c. "
ON THE FREE LIST.		
Sulphuric Acid	¼c. per lb.	Free
Wood Alcohol	20 p. c.	"
Blue Vitriol	¼c. per lb.	"
Borax (crude)	2c. per lb.	"
Soda	2c. per lb.	"
Charcoal	20 p. c.	"
Phosphorus	18c. per lb.	"
Bauxite	$1 per ton	"



ELECTRO PLATING LITERATURE

To the Editor of The Metal Industry:

I have received from the secretary of the American Electrochemical Society, several papers dealing with the electro-deposition of gold, silver, nickel, copper, brass and bronze on which discussion is invited. Two papers by Mr. C. W. Bennett purporting to treat of the deposition of copper, brass and bronze, particularly attracted my attention. At the outset it may be stated that brass plating has become a great commercial business and is rapidly extending. Experienced platers find no difficulty in maintaining their solution in a proper condition, and producing a reasonable thickness of deposit. As Mr. Bennett has not introduced any new formulas, nor even suggested along what lines progress could be expected, his papers are of no value, except perhaps as historical matter.

Considering the august body before which these papers were read and discussed, one would naturally expect to find some original investigation, or at least an epitome of modern practice in the deposition of brass and copper. Instead, what do we find? Simply a rehash of obsolete and discarded formulas garnered from the dim past, when brass plating could hardly be considered to have been on a firm commercial basis. Mr. Bennett very appropriately prefaces his remarks to bronze plating with the statement (referring to formulas for solutions): "that practically all of them are impractical." He then proceeds to give about a dozen of these beautiful formulas. What hodgepodge to read before the American Electrochemical Society. Imagine anyone with the audacity to quote a writer like Fontaine, in reference to modern practice in the deposition of brass and bronze! It may be stated with equal truth that with a few exceptions the solutions given for brass plating are also "practically impractical." In all we find 21 formulas for brass plating. Here is the first on the list:

Copper sulphate	3	grams.
Zinc sulphate	26	"
Potassium cyanide	60	"
Water	1	litre

Mr. Plater, do not try this formula or you will be disappointed. Who with any knowledge of modern plating would consider using the sulphates in a solution of potassium cyanide in making up a brass solution? The cyanide would cause a precipitate

and additional cyanide would have to be used in order to dissolve the precipitate and bring the metals into solution. Here we have an unnecessary waste of cyanide. For the present the plater will do well to continue the use of the carbonates. Other formulas are given in which the chloride, acetate, nitrate and oxide are recommended. One that is particularly illogical is made up with copper carbonate and zinc sulphate in a solution of potassium cyanide. Why not use zinc carbonate also? We also note that ammonium nitrate is given in some of the formulas, and it would be interesting to know for what purpose this chemical is used. These formulas cannot be recommended and the plater will continue to stick to the carbonates and potassium cyanide in making up his brass solution.

To show how unfamiliar Mr. Bennett is with modern practice in brass and copper plating we quote this choice statement from his paper on copper plating: "The object here is to obtain a thin, smooth coating over the surface of the metal, of such a nature that the iron will not be dissolved by and contaminate the nickel solution." This statement refers to the practice of copper plating before nickeling. We wonder how much iron would dissolve in a nickel solution having a specific gravity of 6 deg. or 7 deg. Baumé and being nearly neutral, such as is used in practice; considering also that the current is switched on after the short time required in filling the tank. Coppering before nickeling is done in order to insure cleanness, to give the article a higher finish, or to produce a coating that is more rust-proof, and not from any possibility of the iron dissolving in, and contaminating the nickel solution.

Some of Mr. Bennett's cyanide solutions behave in a very mysterious and uncharitable manner. For instance one will act friendly towards zinc and coat this metal over nicely, while it will not be on speaking terms with iron or steel and refuse to plate on these metals. Any cyanide solution that would be practical in plating zinc will also be practical in plating iron and steel. Oh fie, Mr. Bennett! How could you have the heart to resurrect these venerable formulas and parade them before the enlightened platers of today, after their long and peaceful interment in the quiet and sequestered fields of electroplating literature!

In contrast to Mr. Bennett's performance we note the able paper on the electro-deposition of lead by Mr. Frank C. Mathers. Here we find a large amount of valuable, modern investigation and formulas. Mr. Mathers' paper is probably the most complete and valuable contribution on the electro-deposition of lead that has ever been published.

The paper on the Electro-deposition of Cobalt and Nickel, by Mr. Oliver P. Watts, is well worth the study of every plater. While it contains many useless and discarded formulas, there is also considerable modern formula and data not found in the text books on electroplating.

Mr. Francis C. Frary's paper on the electro-deposition of gold and silver aims at "a compilation of all recipes for plating gold and silver" from "sources available to the author." All responsibility for formulas and statements is laid on the shoulders of other writers. As a compilation of this nature it may be said to be a success, but it is to be lamented that most of the matter is drawn from a class of text books that are rapidly going out of use as a guide for the modern plater. There is, however, considerable up-to-date matter gathered from various sources, that will prove of interest to the progressive plater.

EMANUEL BLASSETT, JR.

Burlington, Vt., April 14, 1913.

PLATERS' SALTS AND COMPOUNDS

TO THE EDITOR OF THE METAL INDUSTRY:

We have read with considerable interest the correspondence in your April number relative to Platers' Salts and Compounds, and have read your editorial which deals with this in a very masterly manner. It is true that modern improvements are now including the art of metal finishing and that recently many new salts and compounds have been placed on the market. It would be foolish to claim that one or all of these salts would prove a "cure-all," as the plating industry presents many complex problems, and manufacturers sometimes fail to give proper attention to details. This is in nowise a reflection on the manufacturer, but merely means that one person may interpret instructions in a different way from another.

For instance instructions might be given which specifically state that boiling is essential to success, and one man interprets this to mean that boiling water should be used and acts accordingly, and is surprised that he does not obtain satisfactory results. Another man will insert a hose into the solution and pass raw steam through it and at a certain point will consider that the solution has been boiled. The honesty of purpose of either cannot be questioned, but in nine cases out of ten they have not succeeded in actually boiling the solution and have failed to follow instructions.

Your editorial therefore, in calling attention to this very point, should serve its purpose exceedingly well and should direct the consumer's attention to the fact that if he buys an improved salt or compound for which he pays a comparatively high price, he should, in justice to himself and to the supplier, be sure that the supplier's instructions are followed out to the letter. Failure to do this entails a loss both to himself and to the supplier; not only a loss on his first investment, but a loss resulting from "turning down" an article which if properly handled may be of value to him for a long period. We are convinced that the agitation of this question will greatly benefit both the supplier and the consumer.

PERCY J. BROWN,
General Manager.

NEW YORK, April 28, 1913.
B. O. Bowers, chemical department.

TO THE EDITOR OF THE METAL INDUSTRY:

In compliance with your invitation for platers who have tried the new nickel salts which have been advertised so much, to give their experience, I want to say for the benefit of Mr. Nelson, of the Lake City Plating Works, and others, that I have tried the "Chinosol" salts, and do not find them superior in any way to the ordinary double nickel salts. I do not think a single claim that the dealers make for them can be substantiated.

S. M. FERGUSON,
Foreman plater for Great Western Stove Company.
LEAVENWORTH, KAN., May 5, 1913.

Last month we published letters from manufacturers of plating salts and compounds, this month we hear from both manufacturer and plater. Mr. Ter Doest's article on "Nickel Plating," published in this issue of THE METAL INDUSTRY, is particularly forceful and we hope it will be widely and carefully read. We invite expressions of opinions from manufacturer, dealer and consumer alike.—ED.

BRASS AND COPPER PLATING

TO THE EDITOR OF THE METAL INDUSTRY:

We note that in the April number of your paper on page 173 there is an article entitled "The Brass and Copper Plating of the Future," by Mr. E. G. Lovering, in which are described methods of cleaning and depositing brass or copper in one operation.

For the information of your readers and to avoid trouble we would state that the use of solutions, such as described by Mr. Lovering are covered by United States patents issued on June 8, 1909. We are offering on the market the solutions covered by United States patents above described, and would state that the owners of the patents are prepared to uphold their rights and to prosecute any infringement thereof. Undoubtedly Mr. Lovering's formula is a mere coincidence, but its use by others in view of the solutions being patented might unintentionally lead them into litigation.

PERCY S. BROWN,
General manager B. O. Bowers Company, chemical dept.
Sole agents United States for Waldberg & Co., Paris, France.
NEW YORK, May 1, 1913.

NEW BOOK

TRANSACTIONS OF THE AMERICAN ELECTROCHEMICAL SOCIETY. General index. Volumes I to XX—1902 to 1911. Size 6 by 9¼ inches. 137 pages. Bound in cloth. Published by the Society, Jos. W. Richards, secretary, South Bethlehem, Pa.

This book is the general index to the society's literature from 1902 to 1911, and will be invaluable to members and others of the society who have the transaction of these years.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

I am interested in a bronze containing 3 to 4 per cent. aluminium. The alloy can be rolled easily, but the sheet resulting is defective on account of being covered with spills and flakes. I shall be glad if you can inform me if there is any known way of preventing this.

Vanadium copper is a good deoxidizer for aluminum bronze. Add from ¼ to ½ pound of 25 per cent. vanadium copper to each 100 pounds of the bronze. It is advantageous to cast the slabs for rolling by means of a skim-gate that will remove any oxide or dirt present.—J. L. J.

Q.—Please give us a formula for an hydraulic metal for pumps and valves. We wish a very dense alloy, one that will stand a test of 10,000 to 12,000 pounds to the square inch.

A.—A very good hydraulic metal consists of copper 100, yellow brass sheet 25, tin 10. This alloy must be melted, cast into ingots and then remelted to secure a dense close-grained metal. —J. L. J.

ANNEALING

Q.—We are having a lot of trouble owing to the hardness of sheet silver. Our bullion dealer guarantees it all virgin silver, but when we get it in we find it so hard and quite a steely spring about it, that our spinners find great difficulty in getting this down through the various courses and it very often splits in lapping or necking. Can you explain the cause?

A.—Your sheet silver is too hard for spinning. It should be annealed dead soft. As the spinning operations are carried out the silver will become sufficiently hard again for your purpose and avoid splitting.—C. H. P.

BLACK SCALE IN MOLDING SAND

Q.—We are having considerable trouble with the black scale in our molding sand that adheres to the mold and becomes mixed when the flask is dumped. When the sand is sieved by hand it does not break up.

A.—The black scale that is giving you trouble is the sand that comes in contact with the metal and which has been burned by it. When the molds have been dumped this hard sand scales off and becomes mixed with the rest of the sand. Hand or power riddling is always resorted to for breaking up the lumps or scale and mixing it with the other sand, and all refuse is thrown aside. Since the power riddling or sieving machines have come into use it breaks up all the hard parts. I do not know of any other method employed except the power riddling method.—P. W. B.

BRIGHTENING

Q.—Can you tell me whether there is a metal or a chemical that can be hung in a nickel bath over night that will tone it up and plate a nice white nickel?

A.—The metal you refer to is Cadmium. This comes in sticks of various sizes. For your purpose one or two pieces 12 inches long and ½-inch in diameter will answer. The metal is usually supported upon the positive pole with the anodes when the nickel deposit is dull and the Cadmium is left immersed in the solution over night and removed in the morning.

A traveler from England supposed to have been in the employ of the Elkingtons Company, of Birmingham, England, sold considerable of this metal to platers throughout the country for the purpose stated. Whether any benefit to the solutions is derived from its use we are not in a position to state. We should be glad to hear from platers who are using such a method.—C. H. P.

A short time ago I wrote to you for an acid resisting mixture for pumps and valves, which you kindly published in THE METAL INDUSTRY. The mixture was 10 parts copper, 2 parts lead, ¾ tin and 5 per cent. phosphor tin. I have been using heavy scrap copper in the mixture and the castings have been a success. Lately, however, I have used cable copper wire in the mixture, and the castings have become spongy and porous. Is this caused through a percentage of silicon being in the copper wire?

I shall be greatly obliged if you will give me your advice in the matter, as our loss in castings has been high.

Fine copper wire oxidizes in melting and castings made with such material are liable to be spongy, while the melting loss is high. Cable copper wire is best handled by melting in a reverberatory copper refining furnace and casting into ingots. Ingot copper made in this manner is much superior to ordinary casting copper.—J. L. J.

CHEMICAL

Q.—Please inform me how much carbonate of copper will one pound of sulphate of copper give when made into carbonate of copper and also how much carbonate of zinc will one pound of sulphate of zinc give?

A.—Two pounds of sulphate of copper precipitated with a like amount of sodium carbonate will give one pound of carbonate of copper. Sulphate of zinc precipitated in the above manner will give the same amount of carbonate of zinc.—C. H. P.

CLEANING

Q.—Can you tell me a way of cleaning small German silver pieces so they will come out bright?

A.—To cleanse small articles of German silver the most satisfactory method is to acid dip them after they have been cleansed from oil and grease. For this purpose use a hot solution of potash, soda, or wash in benzine or gasoline, then give a quick immersing in the acid dip composed as follows:

Aqua fortis	1 gallon
Sulphuric acid	½ "
Water	1 pint
Common salt	½ ounce

After dipping wash well in clean water and dry out by the aid of boiling water and finish drying in maple sawdust. If the first immersion does not give a good bright color repeat the operation, but do not dry out between the operations.—C. H. P.

COLORING

Q.—Can you give me the formula used by tool makers for coloring zinc black when laying out gears, etc.?

A.—To produce a black color for your purpose prepare a solution consisting of 2 to 4 ounces of copper ammonium chloride in one gallon of cold water, then apply with a soft camel's hair brush or soft piece of rag, then dry the zinc with a low heat for a second or two. If the black is not deep enough apply a second coating in the same manner.—C. H. P

CORING

Q.—I wish to make a rubber core in brass tubes and rubber moulded top or knob to same. What is the method of liquefying rubber for pouring and the material of moulds?

A.—Rubber is usually made up into a plastic mass with various filling materials and a percentage of sulphur. It is molded to shape and then heated in a vulcanizer when the sulphur is made to combine with the rubber. Where thin rubber tissues are wanted, the pure rubber may be dissolved in various solvents and the tissues formed by dipping molds of clay or other material into the dissolved rubber.—J. L. J.

DIPPING

Q.—Please publish a formula for a bright dip for gray iron castings to use for pickling in order to eliminate scratch brushing.

A.—Unlike copper, bronze or brass, iron or steel is not as readily acted upon by the mixture of the commercial acids such as sulphuric and nitric acids. The reason is that iron or steel does not dissolve as readily as the cuprous alloys and so it is necessary to assist the brightening of the surface by mechanical methods, especially with articles that have deep ground work. We do not believe that you will be able to overcome the scratch brush operation by the use of an acid mixture.

The following composition has been recommended as a pickle to maintain the iron bright, which you may try:

Oil of vitriol.....28 ounces by measure
Water ..... 3 gallons by measure
Granulated zinc ..... 2 ounces
Nitric acid .....12 ounces

Mix in the order given and use cold.—C. H. P.

ETCHING

Q.—Can you give us a formula to etch our name in our tools? Some are cast steel, steel, etc. We have tried several acids but have failed.

A.—You have probably been using the acids that you have experimented with in concentrated form. This is the reason you have not been able to obtain results. For your purpose use a mixture of one part 38 per cent. nitric acid and four parts of water. In connection with etching use the rubber stamp and caustic soda method mentioned in THE METAL INDUSTRY, July, 1912.—C. H. P.

FINISHING

Q.—In order to settle a dispute will you kindly tell me what finish is old copper, old brass and black copper finish on a piece of spun brass shell? I claim: old copper is brush copper, old brass is brush brass and black copper is oxidized copper spotted off on a buff wheel.

A.—There are so many names used in connection with the finishes you refer to they are very misleading. For instance, oxidized copper is frequently termed antique copper, mottled copper, shaded copper, etc. The same terms are applied to brass finishes. Your contention is correct. The old colonial brass and copper had a surface similar to the brush brass finish of the present time. Black copper is the oxidized copper finish, otherwise without the relief it would be a gun metal finish.—C. H. P.

GALVANIZING

Regarding the section in "Shop Problems" under the heading of galvanizing on pp. 327-8 of the May issue sent us, could you please let us know what proportion or quantity of common black molasses you suggest to be put in the solution.

A.—The proportion of black molasses used in galvanizing solutions to produce a more uniform deposit is from ¼ to ½ ounce per gallon of solution. This same material is also being used extensively as an addition to sulphate of copper baths using the same proportions.—C. H. P.

GILDING

Q.—Can you give me an imitation gold bath that will be a good gold color?

A.—For an imitation gold bath you will have to purchase oreide or gold alloy. This comes in granular form and may be purchased through platers' supply houses. To prepare the solution the alloy is dissolved in nitric acid and then precipitated as carbonates with sodium carbonate, washed carefully and then dissolved in cyanide. The bath is used at a temperature of 180 degrees Fahrenheit and should contain not less than ½ ounce of metal and 4 ounces of cyanide to the gallon. This solution is only used as a flash deposit to imitate gilding.

Articles such as buckles, etc., made from brass and polished are usually given the gold color by first lacquering and then dyeing in a gold dye. For information correspond with lacquer manufacturers.—C. H. P.

LACQUERING

Q.—We relacquer a quantity of builders' brasswork, and a day or two after it is polished and lacquered it sweats out, staining the work, and of course spoiling the appearance of the lacquering. Can you give us a remedy for this? The above only appears to refer to work which has been put through the potash to get the old lacquer off.

A.—To overcome the difficulty you refer to, after the lacquer is dissolved wash the articles in cold water in which they should remain for several minutes, then plunge them in boiling water for a few seconds, then directly in the cold water again. This produces an expansion and contraction of the metal and will force out the potash from the pores. As an extra precaution maintain a hot water bath to which is added either one ounce acetic acid or two ounces of red argols to each gallon of water, immerse your articles in this acid solution for a few minutes at the boiling temperature. This method in connection with the above should overcome any future trouble. Note—26 per cent. acetic acid may be used. Red argol is the crude cream of tartar of commerce.—C. H. P.

PICKLING

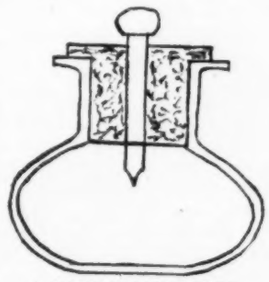
Q.—What is the best pickle that will remove the sand from brass and iron castings?

A.—The best pickle for removing sand from brass or iron castings consists of a warm solution of hydrofluoric acid and water, using 1 part acid to 4 parts water. You cannot use the acid in earthenware or chemical stone jars because the acid acts upon anything of a vitreous or glassy nature. Use a lead lined tank or a part of a whiskey or wine barrel for the purpose.—C. H. P.

SOLDERING

Q.—What is the best container to use for holding soldering acid and keep same clean and free from foreign substances?

A.—Get a short necked decanter shaped bottle or old mucilage bottle as near like the one shown in the drawing as possible. Next, make a bushing of hard rubber, or anything that will not shrink or swell, to fit the bottle like a cork and set same flush with the top. Be sure to make the cork or bushing funnel shaped and hole in center of same plenty large enough to refill and clean. After putting the cork in the bottle put in your acid, fit an ordinary medicine dropper or fountain pen filler through with a sliding soft rubber washer ⅛ inch thick, which can be adjusted on the dropper and inserted in the container to any desired depth. Users of this outfit will find it a great deal more convenient than the old-fashioned cup which gets all kinds of refuse in same.—P. W. B.



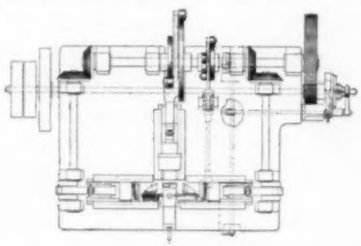
A SIMPLE CONTAINER.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

1,056,012. March 18, 1913. **Machine for Forming Metal Cups.** John E. Dobson, of New York, N. Y., assignor to E. W. Bliss Company, of Brooklyn, N. Y., a corporation of West Virginia.

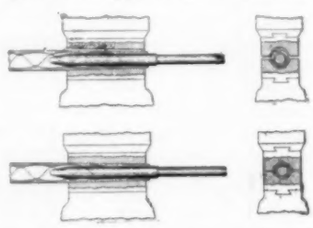
This invention relates to apparatus designed, as shown in cut, especially for forming elevator buckets, but adapted also for bending or shaping other sheet metal articles of similar cupped-shape or of such shape as to be capable of being made by a like or analogous series of operations.



Elevator buckets of small size or those made of ductile metal can, in some instances, be drawn as seamless cups by means of ordinary drawing dies. But for buckets of larger size or where the use of ductile metal is not suitable, it is necessary to seam the buckets, and in such case they are bent up from a previously-stamped-out blank of sheet metal, and after being bent to shape the overlapping portions or seams are united by rivets or by brazing as may be required.

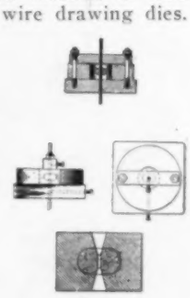
1,056,326. March 18, 1913. **Manufacture of Seamless Tubes.** Samuel E. Diescher, Pittsburgh, Pa.

As is well known to those skilled in the art it has been heretofore practically impossible when piercing is effected by the conjoint action of rolls and a mandrel to produce seamless tubes of uniform gage thickness of wall. This is due to the fact that in piercing the billet an irregular inner surface is produced. This irregularity consists generally of inwardly projecting spiral ribs of a pitch corresponding to that of the twist of the billet during the piercing operation. While this irregularity is somewhat reduced or modified in the reduction of the pierced billet to the finished tube, it has not been possible to wholly remove it by any of the methods now in use for reducing the pierced blank. This invention, shown in cut, has for its object the reduction of the irregularities produced in piercing and the production of a blank having uniform gage or thickness of wall throughout its entire length.



1,056,694. Patented March 18, 1913. **Method and Apparatus for Making Wire Drawing Dies.** Frederick Krause, Jersey City, N. J.

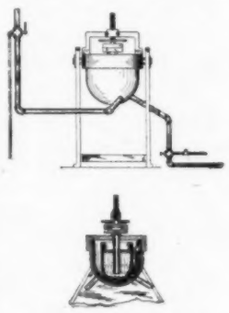
This invention relates to an improved method of and apparatus, as shown in cut, for making wire drawing dies. Heretofore the casting of mantles around precious stones, preferably diamonds, was effected by supporting the diamond in the direction of its boring upon one or between two broad plates to hold same in position while casting a ring of metal, such as steel or nickel alloy around it, and to conduct away from the stone the high fusion heat of the metal of which the setting is composed. Wire drawing dies produced according to the above mentioned method are deficient in that the diamond, during the operation of drawing the wire does not have any support in the direction of its boring because the outer side of the boring is free from supporting material, therefore, the diamond itself has to bear the entire strain of the drawing of the wire. This quite often results in a splintering of the diamond around the opening or of tearing out particles at that side of the boring where the wire leaves the die.



It is the purpose of the present invention to overcome the described deficiencies and produce a wire drawing die whose stone is provided with a metallic mantle cast around it so that practically the boring alone is left free. Thus the stone has a strong support on part of the mantle during the drawing of the wires. To attain this purpose, the stone must be held between two conical pointed rods within the mold.

1,054,789. March 4, 1913. **Die Casting Machine.** Layton M. Parkhurst, of Indianapolis, Ind., assignor to the Indiana Die Casting Development Company, a corporation of Indiana.

The object of this invention is to improve the construction and operation of stationary die casting machines, as shown in cut, whereby the manufacture of castings from certain metals will be facilitated and their quality, particularly their density, be improved.



The chief feature of the invention consists in utilizing the products of combustion for forcing the molten metal out of the crucible into the die. It is accomplished by reversing the movement of the products of combustion by introducing compressed air into the exhaust passageway far enough away from the crucible so that the pressure of the air will force the products of combustion backward under sufficient pressure to force out the molten metal and keep the air entirely out of contact with the metal. Also a floating plunger plate rides loosely upon the metal in the crucible and around the outlet pipe therein. The foregoing not only facilitates the operation of such a device, but it enables the use of compressed air or the like for causing the discharge of the metal into the mold without said air or the like coming into contact with the molten metal. This prevents oxidation and other disadvantages resulting from an outer contact of the air or the like with the molten metal. It also simplifies the construction and mode of operation of the mechanism.

1,057,333. March 25, 1913. **Method of Attaching Rubber to Metals.** Leo Daft, of Rutherford, N. J., assignor to Electro-Chemical Rubber & Manufacturing Company, a corporation of New Jersey.

This patent covers the process of attaching rubber to metals. The claims of the inventor are as follows:

1. The method of attaching rubber to metals which consists in electroplating the article to which it is desired to attach the rubber in an electrolyte made from a plurality of metals, one of which is arsenic, obtaining a deposit containing arsenic and attaching the rubber to the surface thus formed, by vulcanization.

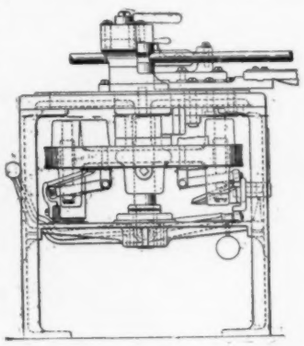
2. The method of attaching rubber to metals which consists in electroplating the article to which it is desired to attach the rubber in an electrolyte made from a plurality of metals, two of which are arsenic and copper, obtaining a deposit containing arsenic and copper, and attaching the rubber to the surface thus formed by vulcanization.

3. The method of attaching rubber to metals which con-

sists in electroplating the article to which it is desired to attach the rubber in an electrolyte made from a plurality of metals, three of which are arsenic, copper and zinc, obtaining a deposit containing arsenic, copper and zinc and attaching the rubber to the surface thus formed, by vulcanization.

1,055,358. March 11, 1913. **Tube-Bending Machine.** Johannes Ruckstuiat, Toronto, Ontario, Canada.

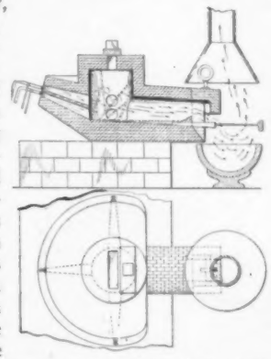
The invention consists essentially in the novel construction and arrangement of parts, as shown in cut, whereby the tube is bent around a forming block and the metal thereof drawn to shape, the outer periphery of the bend being supported from the interior in the drawing operation. The objects of the invention are, to reduce the cost of manufacture of bends of thin tubing used particularly in the manufacture of plumbing traps and to devise a machine for cold bending thin metal tubes of various sizes which will form the desired bend in one complete operation producing a bent tube with a smooth and uniform surface. A further object of the present invention is to devise a machine of simple, strong and durable construction which may be very quickly and easily handled and may be set to form bends of various radii and various arcs.



1,057,882. April 1, 1913. **Process of Fusing and Purifying Metals.** Walter R. Rockey and Hilliary Eldridge, of New York, N. Y., assignors to Metallurgical Research Company, a corporation of Arizona.

This invention relates to the fusion of metals such as copper and particularly to the fusion of electrolytic copper and to the maintenance of its purity during fusion and further purification after fusion.

The object of the invention is to fuse copper and particularly cathode or electrolytic copper, and other metals to which this process may apply, by exposing it to a fuel flame, or a reducing flame, in the presence of highly heated gases, products of combustion and products of gaseous and vapor decomposition which are produced by the burning of a carbonaceous, or a hydro-carbon fuel, and protecting said metal after it has been fused from oxidation by an atmosphere of the gases and other products generated from the combustion of said fuel, as shown in cut, while the molten metal is flowing from the fusion chamber to the ladle, and also while the metal is flowing in said ladle and also while the metal is being poured from the ladle into casting molds.



1,057,423. April 1, 1913. **Metal Alloy.** Elwood Haynes, Kokomo, Ind.

This invention relates to a metal alloy more particularly designed for use in the manufacture of articles, such as tools or cutting implements, wherein are required the quality of hardness, toughness and elasticity, together with the capacity of taking a high polish and receiving and retaining a sharp cutting edge.

Among the objects of the invention are to produce a metal capable of production on a commercial scale and at a moderate cost and having the properties above set forth, and which is particularly adapted for use as a substitute for steel for making cutting implements, machine tools and the like.

Two of the eight claims made for this alloy are as follows:

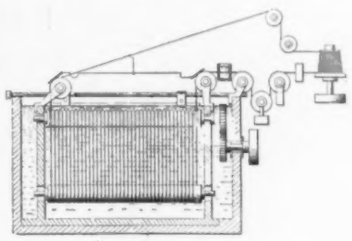
A metal alloy composed of cobalt, chromium and other metal allied with chromium, in the proportion of not more than sixty per cent. (60%) of the metal allied with chromium, the remainder of the alloy being cobalt and chromium.

A metal alloy composed of cobalt, chromium and other metal allied with chromium, in the proportions of from five per cent. (5%) to sixty per cent. (60%) of such metal allied with chromium, the remainder of the alloy being cobalt and chromium.

1,058,047. April 8, 1913. **Apparatus and Process for Making Wire Electrolytically.** William E. Gibbs, of Pittsburgh, Pa., assignor, by direct and mesne assignments, to Gibbs Company, of Plainfield, N. J., a corporation of New Jersey.

The object of this invention is to eliminate the rolling mill from that series of operations whereby a metal is reduced from the form of ingots to the form of wire.

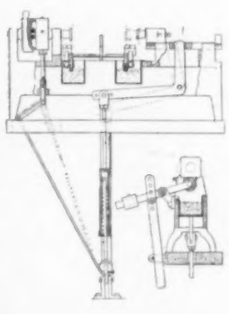
By this process the copper of anodes is deposited upon an endless wire which is kept in motion partly or entirely in the solution in an electro-plating vat, and which is constantly being drawn out from one end of the vat, thence through a draw-plate and returned by means of suitable mechanism to the remote end of the vat through which it again passes. It is the sense of the invention that the wire which leaves the draw-plate shall be substantially the same as that with which the process started. Thus if No. 14 wire were placed in the vat, it would be drawn through a No. 14 draw-plate. By this means the copper which has been deposited on the original wire during its passage through the electrolytic solution causes the wire which reaches the draw-plate to be of somewhat larger size than it was at the point where it entered the solution. The process of drawing the wire through the draw-plate constantly restores the wire to its original diameter, whereby the growth of the wire, by the gradual addition of copper from the solution is lengthwise. By means of suitable mechanism the wire is fed into one end of the vat at the same rate that it is taken out from the other end. Therefore the vat is always full of wire and consequently working at its maximum capacity in depositing copper. Since the wire on its passage through the draw-plate is elongated, it will move more rapidly than that portion which is being returned to the vat, so that wire will constantly accumulate outside the vat in exactly the proportion that copper has been added to it during its passage through the solution. When a sufficient quantity has, in this way, accumulated outside the vat, the wire on each side of the finished coil is cut. The coil is removed and the ends of the shortened wire are joined by welding. The process then goes on as before until another portion of wire has accumulated. This same inventor has been granted another patent (1,058,048), making radical improvements in the methods and apparatus described above.



1,058,439. April 8, 1913. **Means for Applying Flux to Articles to be Soldered.** Morris Karp, of Passaic, N. J., assignor to Passaic Metal Ware Company, of Passaic, N. J., a corporation of New Jersey.

This invention has reference to applying soldering flux to articles to be soldered, and has particular reference to applying flux or acid to the ends of tin cans and analogous articles, such as to the top and bottom thereof, preparatory to soldering the same.

In carrying out the invention there is provided means, as shown in cut, for rotatively supporting a can or analogous article, a flux or acid bath beneath the can, a brush or roll to dip into the bath and to engage the can seam, and means for operating said brush and to permit the latter to freely follow the contour of the can body.



EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

THE NEW ABBOTT OSCILLATING BURNISHING BARREL

Most manufacturers of small metal goods are more or less familiar with the Abbott Patent Burnishing Barrels as there are several hundred of them now in use all through this and foreign countries that have been the means of saving manufacturers enormously on the finishing of small metal goods over the old process that they have heretofore been using. There has been quite a demand however, for a burnishing barrel that would take work longer than 16 inches, which is the widest barrel that The Abbott Ball Company, Hartford, Conn., have been manufacturing, therefore, they have brought out what they call their new oscillating barrel to take care of long articles.

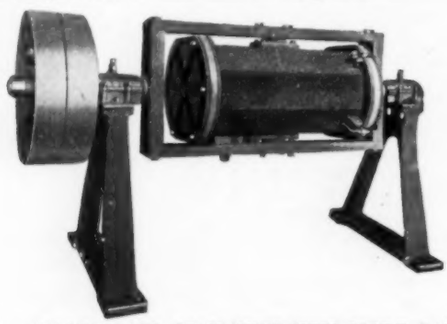


FIG. 1. ABBOTT BALL COMPANY'S NEW STYLE BARREL.

The cut, Fig. 1, shows this new style barrel in one of its running positions. The inside dimensions of the barrel are 12 inches in diameter and thirty inches long, octagon in shape, and lined with hard maple and opens on end by loosening four nuts on swing bolts and swinging them back, which allows the cover to be removed. The barrel itself is held on trunnions in a yoke, and one striking feature of this barrel is its locking mechanism.

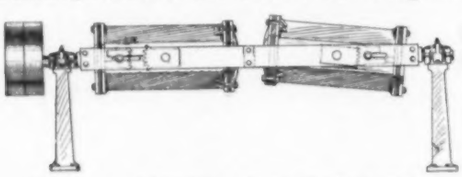


FIG. 2. A DOUBLE OSCILLATING BARREL.

Fig. 2 shows a double barrel of this style. The barrel on the left-hand side, as will be noted, is locked in a straight horizontal position and the barrel on the right-hand side is locked at an angle of 5°. Fig. 3 shows a single barrel locked at an angle of 10°. Fig. 4 shows the cover removed and dumping the contents after being burnished.

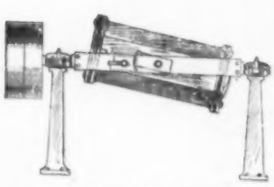


FIG. 3. A SINGLE BARREL LOCKED AT 10°.

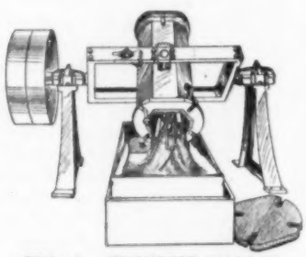


FIG. 4. SHOWING BARREL EMPTYING CONTENTS.

The sides of the yoke are made of channel irons and there is a cast iron locking piece that slides in this channel iron with suitable locking mechanism to fasten it. In the straight horizontal position it is locked by a slot in the sliding lock member, engaging with the lug which is cast on the side of the barrel proper. In each of the other positions, namely, 5°, 10° and 15°, it is locked by having teeth in the opposite end of the sliding lock which engage with corresponding teeth on the outside end of the trunnion bearing on the barrel. When the locking mechanism is disengaged, the barrel can be swung in an upright position to load, and can be turned over on the main bearings for dumping the contents as shown in Fig. 5. In being able to lock the barrel at different angles for running, it gives more or less of an oscillating motion to the contents and the angle that it should be set at can be determined by the character of the work to be finished.

In using this barrel, instead of filling it one-half or two-thirds full of work and balls as is the case with the other barrels of the "Abbott Make," the barrel should be filled almost entirely full with work and balls, using the special soap chips and water as usual. In this way the work has no chance to turn on end or move enough in the barrel as it would in a small diameter barrel, where it is only partially filled. Small work, however, running up to a few inches in measurements can be finished more satisfactorily in the regular Abbott Patent Burnishing Barrel. Their idea in bringing out this barrel is merely to take care of the manufacturers who have such work as sash rods, etc., to finish. The Abbott Ball Company will be glad to furnish further details, address them Abbott street, Elmwood District, Hartford, Conn.

METAL INSURANCE*

By L. M. Stocking.

Is this an unfamiliar term? Yet it is the thing to do and the live owners of property are adopting it throughout the country. If the rate for fire or life insurance is too low, you think twice before giving your risk to that company, as you doubt its ability to carry out its contracts under all conditions. If the rate is too high, you shun that company as an enemy of economy. A fair price for the best protection in a concern of reputation, is your motto, and ours, in writing you this homily. What are we driving at? Why, metal insurance by protective paint! Have a paint policy, Mr. Owner! Do not paint your structures spasmodically. Metal surfaces should be inspected regularly and a paint applied which will give the longest service, as you understand how it is possible to save in labor cost by infrequent repainting. Do not be deceived by the temporary allurement of a lower cost for paint of cheaper quality and resultant shorter service. A structure well painted is insured against decay and depreciation. Thus your property inventories higher and your profit and loss account stands you in more on the credit side. Never paint spasmodically; do not let your structure run down and then make a fruitless effort to bring it up to efficiency. This is waste of money and hits you hardest at your weakest time. Use the best paint; make regular inspection; and paint with the paint that lasts longer: DIXON'S SILICA-GRAPHITE PAINT. It is made in four colors—ONE QUALITY only, and is equally suitable for metal or wood. It is the world's greatest endurance paint and we can say no higher word for it than the leading railroads and manufactories have adopted it, after exhaustive tests, as their maintenance paint. Use it in the original packages. Nature's unrivalled mixture of the silica and graphite is alone mined by the Joseph Dixon Crucible Company at Ticonderoga, N. Y. You cannot get an equally satisfactory paint from any other manufacturer.

*In the February issue of *Graphite*, published by Joseph Dixon Crucible Company, Jersey City, N. J.

THE HAWLEY DOWN DRAFT FURNACE CO.

This company was organized at Easton, Penn., in December, 1912, and purchased the complete manufacturing plant, patterns, patents and business of the former Illinois company which went into bankruptcy last summer. The company is amply financed and is a close corporation, the stock all being owned by Eastonians, and none of the former company's officers have any connection whatever with the business, and the business is being conducted upon a more liberal policy than it ever has been.

The principal articles manufactured are the original Down Draft Smokeless Furnace for heating and steam plants which have been a government standard for nearly twenty years, and the Hawley-Schwartz Metal Melting Furnaces, in which our readers are undoubtedly more interested, which is used for melting and refining of Steel, Semi-Steel, Grey Iron, Brass, Bronze, Copper, Aluminum, etc., and are in use in many of the largest manufacturing industries and by the railroads of this country and many of the foreign countries. New selling agencies are being established in the principal cities. The officers of the company are W. J. Daub, president, and Theo. E. Daub, secretary-treasurer.

AN INSTALLATION OF HAWLEY-SCHWARTZ FURNACES AT THE WESTINGHOUSE ELECTRIC AND MANUFACTURING COMPANY, PITTSBURGH, PA.

NEW KEROSENE FIRE POT

THE CLAYTON & LAMBERT KEROSENE FIRE POT.

The Clayton & Lambert Manufacturing Company, Detroit, Mich., have designed an improved kerosene fire pot known as the No. 25, Fig. 1. The burner is especially designed to superheat the gas before it is burned, producing an intense heat, and the flame is protected by an adjustable wind shield. To facilitate cleaning the burner, in case impure kerosene is used, a wire gauze strainer and removable tube is provided for the generating chamber. Also a knife shaped cleaner is furnished for cleaning the orifice or fuel opening in the burner. It is said that the small amount of fuel consumed in this fire pot in comparison with the intense heat produced, is quite remarkable, making this fire pot especially economical in operating.

RICHARDS' SPECIFIC GRAVITY SCALE

The paragraph in the description of Richards' Specific Gravity Scale in the April number of THE METAL INDUSTRY, reading: "The Richards' Specific Gravity Scale was devised for the purpose of affording a quick and accurate method for estimating the percentage of tin-lead and antimony up to 24 per cent. in solder," was in error. This clause should have read: "The Richards' Specific Gravity Scale was devised for the purpose of affording a quick and accurate method for estimating the percentage of tin or lead in solder and antimony up to 24 per cent. in an antimony and lead alloy." In explanation of this correction, we might add that it is misleading as the scale will not determine the percentage of antimony in a solder mixture. The one side of the beam determines the percentage of tin and lead in a solder mixture, and the opposite side of the beam determines the percentage of antimony in an antimony-lead alloy.

THERMIT PROCESS METALS AND ALLOYS

Metals and alloys produced by the patented Thermit process have been on the market a number of years and are used extensively where exceptional purity and uniform quality are required. These products include, besides various ferro-alloys, 97-98 per cent. manganese, manganese-copper, manganese-tin, manganese-titanium, manganese-boron, chromium-copper, etc.

In the production of these metals aluminum is used as the reducing agent, being mixed with metallic compounds in a finely divided state. These mixtures, generally known as Thermits, when ignited in one spot, react, and the high affinity of aluminum for oxygen causes it to unite with the oxygen of the other constituent, thus setting the metal free; the reaction proceeds without the addition of heat or power from any external source. As no carbon is used in the reduction of the oxides, no carbon will be found in the metals produced.

A booklet issued by the company enumerates the many uses to which the manganese has been successfully applied. For brass alloys, the addition of 2 per cent., in the form of manganese-zinc or manganese-copper, permits the zinc content of the brass to be increased considerably. For nickel castings, 2 per cent. of the manganese added as a deoxidizer to produce a denser metal, acts, it is claimed, better than magnesium, because there is no danger as there is with magnesium, should the amount added be excessive. In copper-nickel alloys, german silver, and in nickel alloys, the manganese also gives good results.

For aluminum alloys, an addition of manganese-copper, free from iron, increases the strength and density of the casting, the alloy can be more easily machined and, it is said, the cost is less than if nickel were used and the results superior to those obtained with either nickel or zinc. An addition to aluminum of 5 per cent. manganese-titanium gives an air-resisting alloy.

As pointed out by the company the main advantage of pure manganese as compared with ferro-manganese lies in the fact that ordinary ferro-manganese, with about 80 per cent. manganese usually contains 8 per cent. to 9 per cent. of iron, the remainder being made up of carbon and other impurities. In making alloys with copper, therefore, there will always be a quantity of iron in the resulting alloy, which will considerably reduce its tensile strength and fire-resisting qualities. Ordinary manganese-copper contains generally between 2½ to 4 per cent. of iron with 25 per cent. to 30 per cent. manganese, while manganese-copper made from pure manganese contains only about ¼ per cent. of iron. The higher price of pure manganese is counterbalanced by the uniformity and improved quality of the castings. These advantages can only be obtained by the use of pure manganese and the best electrolytic copper.

In these alloys manganese fulfills two purposes, first, as a deoxidizing agent where, generally speaking, an addition of ¼ per cent. manganese is sufficient. If, however, a larger quantity is added, it only improves the quality of the bath, and does not

have the bad effect that an excess of other de-oxidizing agents, such as phosphorus, would have.

The "Metals Booklet No. 2058" referred to above contains a large amount of valuable information on metals and alloys, and should prove interesting to all brass, bronze and aluminum founders. It can be obtained free by applying to Wm. C. Cuntz, general manager, Goldschmidt Thermit Company, 90 West street, N. Y.

BRISTOL'S RECORDING DIFFERENTIAL PRESSURE GAUGES

A comprehensive new line of recording differential pressure gauges has been developed by the Bristol Company, of Waterbury, Conn. Some of these recorders have been in successful service continuously since the preliminary models were first sent out in 1908, and the design and construction of the line of these instruments now being placed on the market is based on results obtained in actual service during the last four years. These recording differential pressure gauges are designed for use in connection with venturi-meters, Pitot tubes, orifices, combinations of orifices and Pitot tubes, etc., and thereby to record velocities and volumes of, gas, steam, water and other liquids flowing through the mains and pipes. These recorders may also be used to advantage for recording differences and variations of liquid level in steam boilers, pressure tanks, filter beds, process kettles, etc.

FIG. 1. BRISTOL'S PATENT RECORDING DIFFERENTIAL PRESSURE GAUGE.

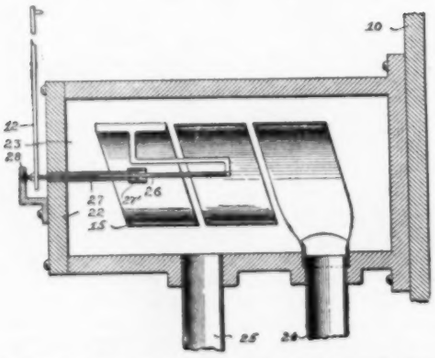


FIG. 2. INTERIOR OF HELICAL PRESSURE TUBE TYPE, BRISTOL'S PATENT RECORDING DIFFERENTIAL PRESSURE GAUGE.

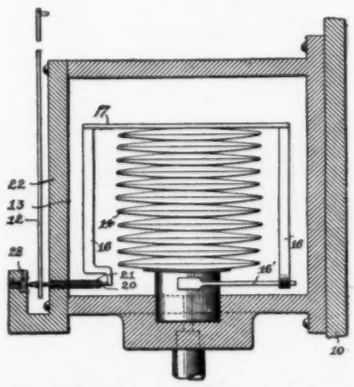


FIG. 3. INTERIOR OF DIAPHRAGM, PRESSURE TUBE TYPE, BRISTOL'S PATENT RECORDING DIFFERENTIAL PRESSURE GAUGE.

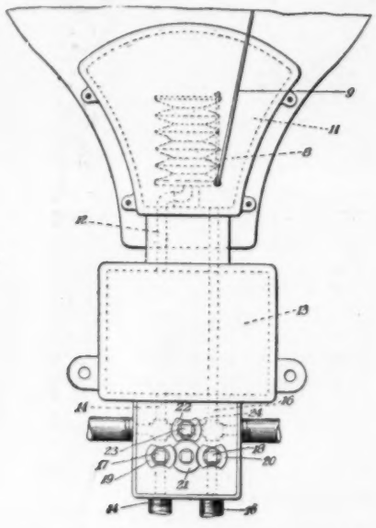


FIG. 4. CONNECTIONS FOR DIAPHRAGM TYPE BRISTOL'S PATENT RECORDING DIFFERENTIAL PRESSURE GAUGE.

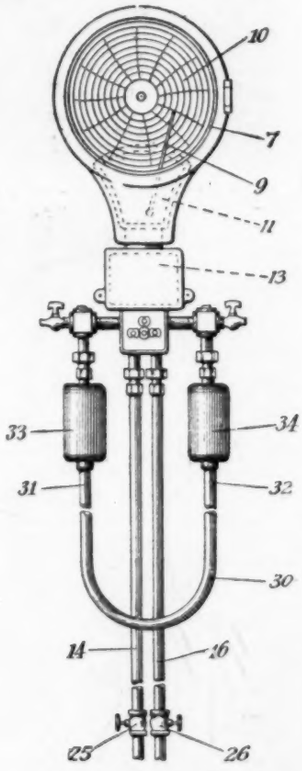


FIG. 5. PATENT SAFETY DEVICE FOR USE WITH BRISTOL'S RECORDING DIFFERENTIAL PRESSURE GAUGE.

The fundamental principle employed in the construction of this differential pressure gauge is that one pressure is applied to the inside of the operating tube while the other is applied to the outside of the same pressure tube within a closed casing. In order to record the movement of the pressure tube it becomes necessary to transmit its motion to the outside of the pressure tube casing. Figure 1 shows the exterior of one type of these recorders. Fig-

ures 2 and 3 show part of the interior construction of the spring tube type differential recorder. In figure 2 pressure tube 15 is of the hollow helical type, used with great success for many years in Bristol recording pressure and vacuum gauges.

In figure 3, 22 is the pressure tight casing enclosing the diaphragm pressure tube 14, and in a similar way one pressure communicates with the interior and the other pressure with the exterior of this tube, and its motion is transmitted by means of the rotating shaft through the sleeve 21 to the recording pen arm 12. The length of this sleeve is many times the diameter of the shaft passing through it, differentiating it from an ordinary bearing.

This patented device permits of the recording of extremely small differences between the pressure existing respectively inside and outside of the pressure tube. It has been found that the simple frictionless sealing sleeve through which the pen arm shaft passes does not produce appreciable resistance to the rotation of the shaft, and at the same time capillary attraction and adhesion prevent leakage of even high pressures from the pressure casing. In figure 4 diaphragm tube 8 is shown in the pressure chamber of the casing 11 directly connected to one end of the rotating shaft passing through the patented pressure seal, and having its other end directly connected to the recording pen arm 9.

Figure 5 shows a patented safety device consisting of a "U" shaped tube 30 partly filled with a suitable liquid, such as mercury or water, this tube having enlargements 33 and 34 each having sufficient volume to accommodate the quantity of liquid contained in the "U" shaped tube. The length of the "U" tube varies with the range of the gauge so that the greatest possible head of the liquid contained in the "U" tube corresponds with the total range of differential pressure that the gauge is designed to record. Should the full static pressure by accident be admitted to either side of the differential gauge, the liquid contained in the safety "U" tube would instantly be forced up into one of the enlargements, thus allowing the static pressure to be applied simultaneously to both inside and outside of the pressure tube and protecting it from being destroyed. There is a great need for these instruments in many different industries, and the field of usefulness for these is rapidly growing. Further information may be obtained from the manufacturers by asking for bulletin "M."

A NEW MOLTEN METAL PYROMETER

The Brown Instrument Company, of Philadelphia, Pa., manufacturers of pyrometers, are placing on the market an improved type of thermo-electric pyrometer for measuring the temperature of metal such as copper, brass, aluminum, bronze, etc., in their molten state. This company has been experimenting for some time in an effort to produce a thermo-couple which will

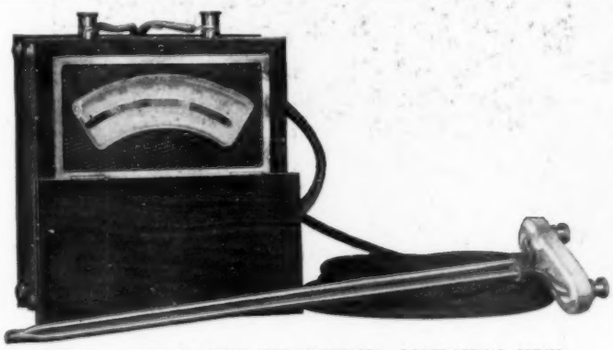


FIG. 1. THE BROWN INSTRUMENT COMPANY'S NEW PYROMETER.

withstand for a reasonable length of time the action of the molten metal. They have been able to produce a thermo-couple formed of nickel alloy rods ¼ inch in diameter which are inserted directly into the metal. On account of this large cross section, the actual size of which is shown in Fig. 2, thermo-couples heretofore used having a cross section of about ⅛ inch in diameter, the life of the thermo-couple has been greatly increased. In conjunction with this thermo-couple a high resistance portable indicating instrument is used which is unaffected by changes in the length of the wire connecting the thermo-couple and the instrument, and which is sufficiently robust in construction for ordinary foundry service.

It has long been recognized that if a reasonable life could be secured from a pyrometer that all foundries would adopt them on account of the importance of knowing the temperature at which the metal should be poured. In the case of this new Brown pyrometer the thermo-couple is inserted directly into

FIG. 2. THERMO-COUPLE OF THE BROWN INSTRUMENT COMPANY PYROMETER (ACTUAL SIZE).

the molten metal before pouring, and the temperature instantly noted. When it has once been definitely determined what the proper pouring temperature is for a certain metal a concern can reproduce results continually, producing uniformly good castings from maintaining the same temperature. This new Brown pyrometer will doubtless be of interest to many concerns which have been on the lookout for an instrument with sufficient life to warrant its regular use in the foundry.

ABRASIVE COMPOUNDS

By Nathan C. Harrison.*

Brown India corundum is without a doubt the finest abrasive of its kind placed upon the market, from the very fact that this material is 95 per cent. pure alumina, more than three times more than in any other corundum mined today. The wheel trade in the United States is fast adopting the use of this material and are meeting with wonderful results in the sale of the wheels they make. We are now beginning to introduce the material to platers and polishers. On account of the rich quality of the corundum we offer, it is quickly purchased by those who realize the class of the article we have, and we look forward to a large and increased business for brown India corundum throughout the United States.

In reference to diamond grit, another of our products, it will be interesting to make a comparison with this material and the general practice. Just stop for a moment and picture what the conditions are as they exist today. A man goes into a sand blast operating room with a great large helmet over his head and shoulders to protect him from the clouds of dust that arise with the use of sand. It is absolutely impossible, or next to impossible for the operator to see the work he is actually doing on account of the dust. By his side are a small pile of castings and a large pile of sand and great clouds of dust.

Contrast this with the man using diamond grit. With the use of diamond grit he does not wear a great large mask. There is absolutely no dust whatever. He can see the casting that he is working on at all times. By his side is a large quantity of castings that have been finished and a small amount of diamond grit to do the work with. He can use diamond grit over and over again; he does not require a larger storehouse for several hundreds of tons of sand. He requires a small corner in a building where he can stock one or two tons of diamond grit.

Diamond grit will clean faster and with considerable less expense than with the cheapest sand that can be obtained, because a ton of diamond grit will do more work than 150 or 200 tons of the best sand obtainable. Diamond grit is being adopted by the sand blast trade very quickly, because it has actually demonstrated to them that they cannot afford to jeopardize the lives of their workmen any longer and go on working in clouds of dust that is not profitable for anyone connected with the industry.

*Harrison Supply Company, Boston, Mass.

SALT WATER GOLD PLATING

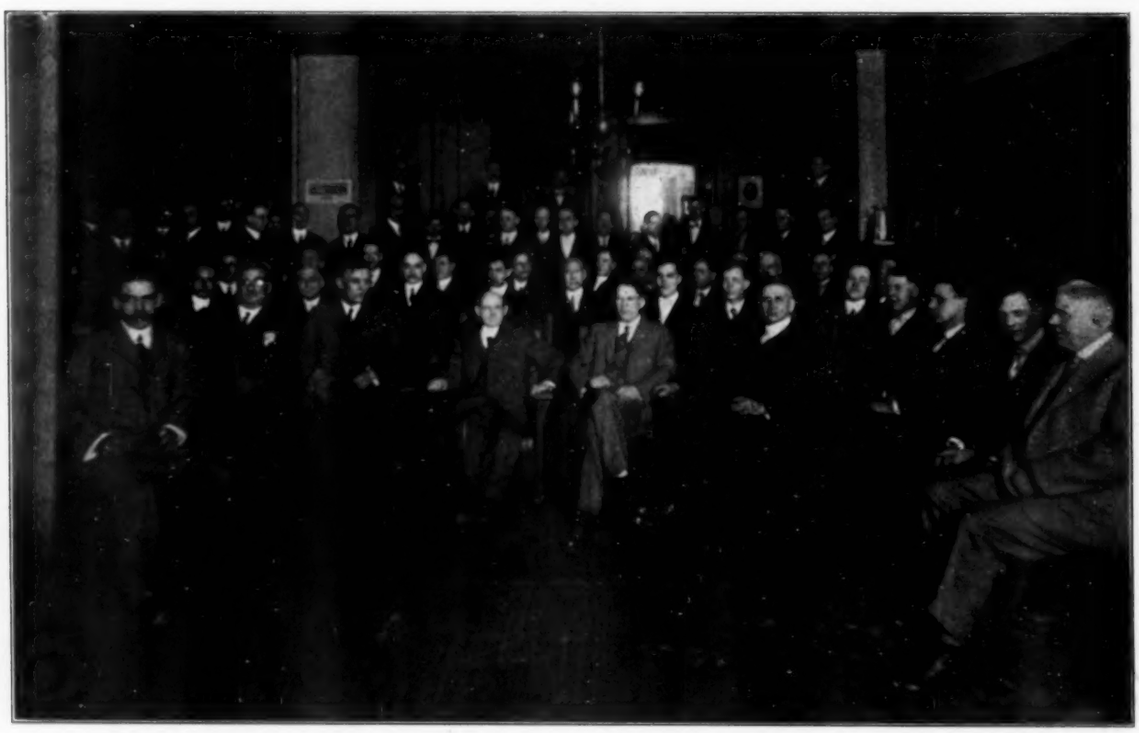
The Roessler & Hasslacher Chemical Company, 100 William street, New York, have been making extensive tests at their experimental laboratory at Perth Amboy, N. J., as a result of which they are now unqualifiedly recommending Trisalyt, the metallic triple salt, for use in gold plating by the salt water process. They state that a substantial saving in the cost of the solution is effected, all the trouble of preparing the gold in the ordinary way is avoided and a perfect finish is secured.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE METAL INDUSTRY ORGANIZATIONS.

ELECTRO-PLATERS' ASSOCIATION

President, Richard H. Sliter, Jersey City, N. J.; Recording Secretary, A. J. Stremel, Brooklyn, N. Y. All correspondence should be addressed to the Secretary-Treasurer, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23rd street, New York, on the fourth Friday of each month, 8 p. m.



THE MEMBERS OF THE DETROIT, MICH., BRANCH OF THE AMERICAN ELECTRO-PLATERS' ASSOCIATION.

The 51st regular monthly meeting of the association was held Friday evening, April 25, 1913. Vice-president Stiehle occupied the chair. There were 38 members present—one associate and four active members were elected. Charters were granted to branches formed in Milwaukee, Wis., and Newark, N. J. No topic pertaining to electro-plating was discussed during the meeting, the time being taken up by the discussion and improvement of the proposed new constitution.

The second open meeting of the Philadelphia branch was held at Dooner's hotel, Philadelphia, Pa., Friday, April 4, 8:15 p. m. The meeting was called to order by the president, F. C. Clement, who welcomed the out of town members and the visitors, after which he called upon C. H. Proctor, the father and past president of the N. E. P. A., who spoke on the formation of the association and the rapid strides it has made, also the benefits to be derived by belonging to the association. He also spoke on the formation of the supreme body. The next speaker was George B. Hogaboom, the newly elected supreme president, who as usual sprung some of his witty remarks for which he is well known. He also spoke of the rapid strides made by the association and the good work it is doing for the plater. The following members from New York also spoke: Percy S. Brown, William Schneider, Mr. Sturdevent, Charles Stiehle, H. H. Smith, of the Tiffany Company, John E. Stearling, Mr. Seviering, Mr. Garde, W. J. Smart, of the Eureka Spray Company, who also gave to each member a souvenir lead pencil

The meeting closed by the president thanking the New York members for their visit to the Philadelphia branch, after which refreshments were served.

The regular meeting of the Philadelphia branch was held April 25, with twenty members present. The revised constitution was approved. Talks on electro-chemistry will be continued on the second Friday of each month at 8 p. m.

THE FOUNDRY AND MACHINE EXHIBITION COMPANY

Secretary Hoyt for the Foundry and Machine Exhibition Company is this year making a special effort to secure a representative exhibit of machinery and supplies used in the founding, finishing and plating of iron and metals. The Exhibition Company desires that besides foundry machinery and supplies that

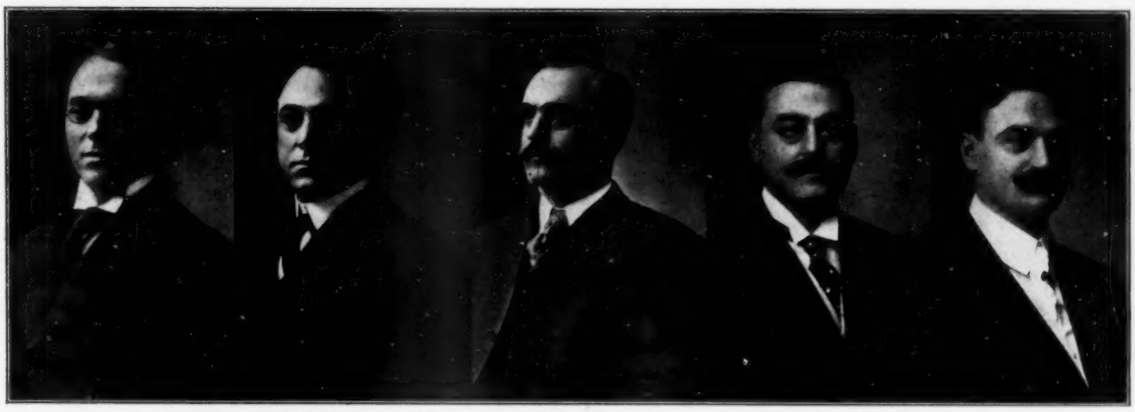
they make a showing of the machinery used in finishing castings, both brass and iron, and also in the supplies used in plating brass and iron. To date the secretary has been very successful in this endeavor, having secured exhibits from twenty machine tool manufacturers. Also he has secured one plating supply house—The Bennett-O'Connell Company, Chicago, Illinois—who also exhibited last year at Buffalo. The secretary desires more plating supply houses to follow the example of this firm, for the Chicago convention next October 10 to 17, promises to be the greatest in the history of the allied foundrymen's associations.

FIVE BROTHERS; ALL BRASS MANUFACTURERS

The Mueller Manufacturing Company, of Decatur, Ill., has the unusual distinction of being composed of five brothers, in whom manufacturing and business talents have been so equally divided that it is not necessary for them to step outside of the family for the head of any department of their big plant. The sixth brother, Henry Mueller, who was an inventive genius and a thorough mechanic, died a few years ago. The other member of the company who does not figure in the business organization is Mrs. Leda Mueller Cruikshank. The divisions of the business are attended to by the following brothers: Adolph Mueller, president and head of sales department; Robert Mueller, secretary and head of purchasing department; Philip Mueller, superintendent of factory, designer and inventor; F. B. Mueller, field secretary and head of traveling force; O. B. Mueller, treasurer, and manager Eastern division, New York City, also of new factory at Sarnia, Ontario.

In addition to being made up entirely of members of one family, the company enjoys other distinctions. All of the Mueller boys were born, reared and educated in Decatur, and the neighboring University of Illinois at Champaign. Under the tutelage of their father they entered either his factory, or business office of same, in boyhood, and were trained under his direction, especially in mechanical lines, and he was a mechanic of extraordinary genius. Under his direction his sons not only learned the business end of the game, but all of them obtained a thorough insight into the practical end of manufacturing. The business of the elder Mueller, however, was limited, and the opportunity for branching out in manufacturing lines came after the sons had attained their majority and were able to see and grasp the opportunities opening up in the brass goods line. Possessing the ambition of wide-awake young Americans they laid the foundation of the present big business, having the advantage of the guidance and practical advice of their father and his wide experience. The spirit of progressiveness has always been nurtured, and today the firm is actively alert to improve each opportunity for strengthening and broadening their business.

The late Hieronymus Mueller, father of the five boys, whose pictures are shown herewith, began business in Decatur in 1857 in a humble way, as a gunsmith and locksmith, his place of business being a little one-story frame building, and from this he constantly expanded and built the foundation upon which rests the Mueller enterprise of the present day. The Mueller boys enjoy still another distinction in the fact that the business which they command today and the fruits thereof, have been the result of patient, steady, determined purpose, unaided by outside influence or finance. The business therefore represents solely their untiring efforts, thrift and good judgment. Many of the older residents of Decatur, who knew and enjoyed the acquaintance and friendship of the late Hieronymus Mueller and remember his humble beginning, marvel at the fact that his five sons should today stand at the head of the greatest industry Decatur knows, and that their name has been carried to every part of the world through the goods they manufacture. This success is unquestionably due in a large degree to the fact that the sons have with unvarying fidelity adhered to the theory and practice of their father, of maintaining the work and product up to the highest degree of quality. All of the Mueller boys are married and have beautiful homes and families, with the exception of Fred, who still clings to bachelorhood and his Beau Brummel ideals known and recognized by convention devotees throughout the land.



THE FIVE MUELLER BROTHERS, OF THE MUELLER MANUFACTURING COMPANY, DECATUR, ILL.

ADOLPH MUELLER, President, and head of sales department.

ROBERT MUELLER, Secretary, and head of purchasing department.

PHILIP MUELLER, Superintendent of factory. Inventor and designer.

F. B. MUELLER, Field Secretary, and head of traveling sales force.

O. B. MUELLER, Treasurer, and manager Eastern division, N. Y. City, and also of new factory at Sarnia, Ontario.

H. E. Biggins, vice-president and manager of the Biggins-Rodgers Company, Wallingford, Conn., has sold his interest therein, and severed his connection with the company. Mr. Big-

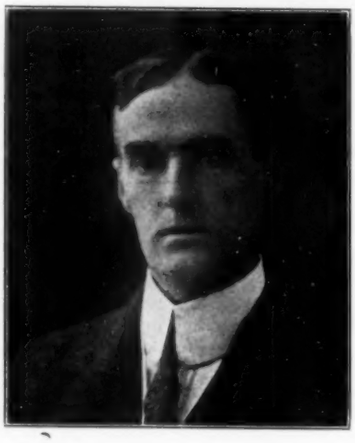
gins is at present enjoying a rest on his farm and has not as yet completed any plans for the future.

Hugh McPhee, 179 Main street, Tarrytown, N. Y., has recovered from the effects of the painful accident he met with three months ago, and expects to form a connection with some reliable foundry and resume active work very shortly. Mr. McPhee was superintendent of Eaton, Cole & Burnham's brass foundry at Bridgeport, Conn., for nine years, has held other responsible positions, and is well known as the originator of a patented process of putting patterns on plates for molding machine work.

DEATH

ARTHUR T. C. FIRTH

Arthur Temple Clifton Firth, was born in Auckland, New Zealand, May 16, 1874, and died in the Roosevelt Hospital, New York, May 1, 1913; being thirty-nine years old, less fifteen days. Mr. Firth was educated, in Auckland, New Zealand, graduating from St. John's College as an Analytical and Metallurgical Chemist, and stood very high in his profession during the succeeding years. He was first employed by the Colonial Sugar Refining Company of Australia in charge of their extensive laboratory for several years. After leaving the employ of the above company he became interested in mining phosphate in several of the islands of the South Pacific Ocean.



ARTHUR T. C. FIRTH,
Metallurgist and Electro-Chemist.

Afterwards he became interested in gold mining and spent three years in the Northern Transvaal of Africa prospecting for gold. During that time he contracted malarial fever, and from a party of twenty-six that originally went to the low countries of the Northern Transvaal only two members returned alive, he being one of them. During his leisure hours at that period he became very greatly interested in the precipitation of metals in their natural state. From these studies came the development and perfection of Voltite plate powders which have become known throughout the world.

Mr. Firth arrived in New York City from New Zealand on January 11, 1912, and he immediately laid plans for the formation of the American Voltite Company. After the formation he became vice-president and general manager of the corporation. He was created an honorary member of the American Electro-platers Society for his contribution to science in the invention of Voltite, and was held in very high esteem by the entire membership of the society. At the Eighth International Congress of Applied Chemistry held in Washington, D. C., in August, 1912, Mr. Firth had the honor to represent his country.

Mr. Firth's death was due primarily to toxic poisoning resulting from a severe attack of pleuro-pneumonia. Mr. Firth was a man of high ideals, and his friends were legion. He had that sweet sympathetic nature that belongs only to men of his calibre and in the words of the immortal Lincoln, "With malice towards none, with charity to all," his untimely demise is sorrowfully regretted by his friends.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS AND TRADE ITEMS OF INTEREST FROM THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

WATERBURY, CONN.

May 5, 1913.

There is little indication hereabouts of the halting of industry reported from some parts of the country, at least in the metal manufacturing branches. There has been a steady and healthy business in practically all lines of metal making and there is little indication of any but seasonal slacking in the balance of this half of the year. Incoming and outgoing freight from the factories here has been equal to that of the past year and ahead of its figures in some respects, which is taken as conclusive evidence of very healthy conditions. Tariff legislation is being closely watched. It will mean a great deal to the manufacturers of several products turned out here, especially those of the American Pin Company and some of the others whose catalogue of novelties is extensive. The hook and eye rates especially are objectionable to the Pin company, for, if they are put into effect, it is doubtful if they can escape the necessity of importing English made goods. This will give them the chance to meet foreign competition in the sense that they will be able to keep their customers, but it will necessitate the laying off of much of their cheaper help.

George A. Driggs, of the American Pin Company, filed briefs opposing the rates and lengthy reviews of the objections made to the Payne Tariff rates in behalf of the company also were placed in the hands of the committee during the hearings. Little is heard of the objections of the other manufacturers hereabouts, but it is known they are not in favor of many of the rates in Winsted and Torrington, and their objections have been laid before the congressional committee.

On the whole, it is understood that the manufacturers of the Naugatuck Valley are preparing to make the best showing possible in the event of the reductions proposed and there are some who go so far as to say that they can meet the effects of the reductions proposed out of their profits. Figures are freely juggled in these calculations and surplus and reserve funds are pointed to as indications of the financial strength of the corporations, but there are no forecasts of the lifetime of such surplus and reserve funds in the event of a tariff for revenue only passing Congress. Meantime the manufacturers are saying little, but "sawing wood." Building extensions go merrily forward. The new tube mill extension of the Benedict and Burnham plant of the American Brass Company, the large four-story addition of the E. J. Manville Machine Company, and the office building of the American Brass Company have been completed as to their exteriors and the summer will see the completion of their interiors. The Chase Tube Mill in Waterville is in operation and in a few months will be occupied by a larger force of employees. Business in the towns outside of Waterbury reflects the same healthy condition as here and the outlook is satisfactory. At this writing there is quite an extensive strike in force on the part of the casting shop employees, who demand higher wages and less hours of work.—F. B. F.

PROVIDENCE, R. I.

MAY 5, 1913.

Providence, with the rest of the country, stands waiting. It is no longer the question as to what the Wilson-Underwood tariff bill will be. It is, what will be the result? The Ways and Means Committee has announced the draft of the proposed tariff and it now remains to be seen what Congress will do with it and then what it will do to the country. Providence is vitally interested. This city is one of the largest manufacturing centers in the United States. While its industries are varied, the city boasts of the largest plants in the country, if not in the world, in silverware, jewelry, files, screws and small tools, and its cotton and woolen interests are alike important. All of these are more or less affected directly, while the indirect influence is inestimable.

The jewelry manufacturers in this city and vicinity are especially concerned in the tariff bill; some voicing the fear that if the tariff schedule on jewelry is passed as it has been drafted they will be forced out of business. While there is a great deal of expensive jewelry made in Rhode Island and vicinity, the bulk of the business is the manufacture of jewelers' findings and the cheaper grades of jewelry, and these are among the products that will be hit the hardest.

Harry M. Mays, of the Metal Products Corporation, and president of the New England Manufacturing Jewelers' and Silversmiths' Association, is not favorably disposed toward the new tariff. He says: "If the new schedule works out as I expect that it will all novelties will come under the metal schedule which calls for a tariff of only 25 per cent., whereas formerly it has been 85 per cent. You can see for yourself what this would do to the manufacturers of jewelers' findings and cheap jewelry. If it is true that certain novelties and jewelers' findings are to be protected by only 25 per cent. duty, German articles can be laid down here, duty paid, at less money than the American manufacturers can now buy the raw product. Cost of labor is not included at all in this proposition. It is needless to say, however, that labor cost will play a big part in the matter. American labor cannot compete with German labor, for instance. In this country and in this section jewelry artisans are exceedingly well paid, and if we are only protected by a duty of 25 per cent. a lot of us have got to go out of business."

The manufacturers of expensive jewelry are not hit as hard by the jewelry tariff schedule as are the manufacturers of the cheaper grades of jewelry. Theodore W. Foster, of Theo. W. Foster & Bros. Company, in speaking concerning the schedule says: "As I understand it the tariff makes provision for a 60 per cent. duty on fine jewelry. That gives fairly good protection, but what we are afraid of is the 25 per cent. 'catchall' schedule. If a lot of articles that are manufactured by jewelers for the trade are included in this 'catchall' schedule it will affect us considerably. It will tend to limit us in our manufacture, because the Germans can manufacture the articles that may be found in this 'catchall' schedule so much cheaper on account of the difference in labor cost, it would be impossible to compete against them with only 25 per cent. protection."

In other lines connected with the metal trades those prominently identified are quietly studying the situation and watching closely to see what the effect is going to be. Many do not fear the direct effect, but the indirect influence is the feature that is keeping them worried. As an example of this may be cited two woolen plants in this State that have announced their close on account of the tariff provisions. One is operated by an English concern which also has mills in England, that says its Rhode Island plant must close as it is impossible to compete with the English mills. The other mill has gone into the hands of a receiver. The effect of this is to throw several hundred operatives out of immediate work.

The largest volume of business in its history, a much greater amount of cash carried to surplus, and percentage earnings on capital stock practically the same as in the preceding year, are features of the annual report of the Silversmiths' Company, the holding concern of the Gorham system. The report for the fiscal year ending February 28, 1913, was submitted by the directors at the annual meeting of the stockholders about the middle of the month.

ATTLEBORO, MASS.

MAY 5, 1913.

By the terms of the Underwood tariff bill, as introduced into Congress, jewelry has been reduced from an average of 75.74 per cent. to 60 per cent. Under the metal schedule, articles composed wholly or in part of platinum, gold or silver and not specifically provided for in that section, 50 per cent. ad valorem. The jewelers were anxious to have their products transferred from the metal schedule to the sundries schedule, where most of the luxuries are taxed, but they did not win out. The chief value of the bill is that many novelties which formerly came in under the metal schedule are now under jewelry, which is considered by the silverware novelty manufacturers as a big boon.

The jewelers have a tariff committee named from their organization and are reluctant to discuss the bill for publication, asserting that their tariff committee will issue all statements. Privately, they say that the mesh bag and rope chain lines will be hard hit by the new duties. One Attleboro manufacturer declared the day after the bill was introduced that no more rope chain would be made in his factory. Charles T. Paye, of North Attleboro, chairman of the Tariff Committee of the New England Jewelers' and Silversmiths' Association, has made a pledge to North Attleboro that in case the tariff hits the present lines hard the manufacturers will endeavor to find new articles to manufacture in order to keep their factories going.

Reading statistics of the low wages paid in the Austrian factories, he showed clearly that unless American manufacturers are protected by a tariff that makes up the difference in the cost of production here and abroad, the American jewelry industry will be dealt a severe blow. Expert gold and silversmiths in Prague, Bohemia, and Vienna, are paid about $6 a week, and in the manufacturing cities in France the wages are not much higher. "We don't want a tariff for the protection of profits," he said, "but for the protection of our labor from the foreign markets. It can be shown that even under the Payne tariff the importations of jewelry increased and it shows what may be expected under a lower tariff."

This is the quiet season in the jewelry trade, but it is marked with a promise of a busy fall. The tariff question continues to bother, and there will be no disposition to go ahead very fast until this important question is settled. The salesmen are out on the road with new lines of samples, and they report fair business, except in the Ohio valley. There is little trade there, but optimism prevails and the rebuilding will put money into circulation that will cause trade to boom along many lines. Most of the factories are working on short time, but that is the usual rule at this time of year and causes no alarm.—C. C. C.

BOSTON, MASS.

MAY 5, 1913.

The Boston Nickel Plating Company, of 160 Portland street, has just added a sand-blasting department, setting apart a special room in the factory for the purpose, and installing machinery of high power and effectiveness.

Labor troubles have disturbed the jobbing brass finishers and platers in Boston, the workmen demanding an increase in wages; $19.50 being asked for by the finishers and buffers and $21 by platers for a 50-hour week. At the plant of Herman Strater and Sons, of Sudbury street, there has been a further hitch over the number of hours, some of the men standing out for a 48-hour week, to which the concern makes reply that it is willing to adjust the matter on an hourly basis equivalent to the rate in other shops that have agreed to the 50-hour week. The Straters enjoy the distinction of being the oldest concern on the oldest street in Boston, retaining its original name of colonial days.

Regarding the probable effect on business by the proposed tariff some of the prominent business men said:

William P. F. Ayer, Walworth Manufacturing Company:

"It seems hardly necessary for New England business interests to show so much apprehension as they do regarding the outcome of the proposed new tariff. The new schedules will not have much, if any, adverse effect upon our metal products, as far as we can see. Of course, if purchasers cut down their

requirements generally, it will reduce our output in proportion, but we fail to see the necessity for adopting that course. Other parts of the country do not seem to take the view of the situation and outlook that is prevalent in this section."

A Boston official of the Chadwick-Boston Lead Company: "It is difficult to estimate the effect of the proposed tariff changes upon lead and its products. If prices of the metal remain at their present level abroad, however, it is probable that there will be little disturbance in the domestic industry on account of importations under the new schedule."

Fred L. Greeley, vice-president of Holden and Herrick: "I don't think the new tariff, if adopted, will affect the cost of stock for copper and brass products much, but ultimately the general effect of the bill in its entirety may be to reduce the demand for labor, and in consequence lower the income of wage-earners."—B.

NEW BRITAIN, CONN.

MAY 5, 1913.

"Tariff tinkering is bound to result in hard times for the metal manufacturing concerns of New Britain." That is the consensus of views expressed to a METAL INDUSTRY reporter by the heads of New Britain's largest industrial concerns. Few of the officials of the large corporations feel that they can take anything but a pessimistic view of the future.

The greatest sensation sprung in this city in connection with the tariff question was the announcement by President Alix W. Stanley, of the Stanley Rule & Level Company, a $5,000,000 concern, that the officers and directors of his company have already begun considering plans for the removal of their factories to Germany. "It is too early yet to tell just what we will do," said Mr. Stanley to THE METAL INDUSTRY man. "The reduction of duties on our lines are large, and the removal of our plant, or at least the division of it and the establishment of one portion as a branch factory in Germany, may be decided upon as the best plan." Mr. Stanley intimated that uncertainty as to the complexion of the administration four years hence is about the only thing that is holding his directors back in this matter.

President Charles M. Jarvis, of the $10,000,000 American Hardware Company, said, "Of course the tariff cuts are going to hurt us. We told the ways and means committee that we could stand some cuts, but they ran the knife pretty deep. There's no use of talking about closing down our factories, because we will not do that, but we certainly will suffer." Treasurer I. D. Russell was in Washington for several weeks looking after the interests of his corporation.

"Rotten." That was what President George W. Traut, of Traut & Hine, had to say of the new tariff bill. He called it worse than the Wilson bill of 1893. Vice-President H. C. Noble, of North & Judd, manufacturers of sadlery hardware, etc., said that if the foreign manufacturers can successfully copy American products in his line, the industries of this country will be badly hurt.—A. L. M.

BRIDGEPORT, CONN.

MAY 5, 1913.

Much interest is manifest among local factories regarding the probable outcome of the proposed tariff revision. However, each factory is at present in a normal condition, and some are even working overtime. The situation is queer, and when sifted down would appear to indicate a desire to "Wait and See." We have not heard of a single instance of a Bridgeport factory moving abroad to take advantage of cheaper labor, and to receive the benefit of the reduced tariff here. Such rumors have reached here from nearby towns, however. Many of the larger factories here are experiencing difficulty in securing common laborers. The large amount of outside construction work going on here is thought to be a large factor in causing this shortage. This trouble appears to be worse this spring than in years past. Skilled labor is about the same as usual.

It is rumored that the E. E. H. Smith Silver Company, manufacturers of artistic cutlery and sterling effects in quintuple plated ware is to move its factory to Worcester, Mass. The factory has been prosperous here, and no reason for the contemplated move has been made public. The rolling mill of the Stamford German Silver Company, located at Springdale, near Stamford, is nearly completed. Mr. Swan, of Seymour, has recently been elected president, and will make his home in Stamford. A permit has been issued for the erection of a new building for the Weed Tire Grip Chain Company, to consist of a one-story building 110 x 250 feet of brick. The location to be on the East Side. The large addition to the mills of the Bridgeport Brass Company, Union Plant on Housatonic avenue, is nearly finished. The company report that business is excellent.

The American Graphophone Company report a very prosperous condition and are about to give an increase to all employees of 8 per cent. in wages, with a decrease of working hours. The factory employs 2,500 hands, and this profit sharing plan of the company is much appreciated by those employed there.

The Electric Cable Company having just completed a large new addition to their already large plant, gave a reception Saturday evening, April 26, in this new building. The reception was largely attended and was a very successful affair. Nearly 1,000 invitations were sent out. Whipple & Choate, the largest manufacturers of yellow brass and composition ingot in the East, have recently installed 37 new furnaces and will have these working by May 1.—L.

NEWARK, N. J.

MAY 5, 1913.

The manufacturers of Newark will be adversely affected if the tariff is lowered to any considerable extent. There are few cities that use more of the metals than this place. As a center for the manufacture of gold jewelry it is the largest in the country for high-grade goods. The low tariff will affect the plater and ten karat goods more than it will the 14 and 18 karat and platinum lines, as there is more labor in the cheaper goods and less metal. In the higher grades there is more metal and less labor. These lines can be made in foreign countries for about half what it costs to produce them here, as wages are considerably more, it costs much more to erect a factory and equip it, the insurance is more and the running expenses are more. The only thing that costs the same on both sides of the water is metal.

There is a large amount of sterling silver and plated lines made here, and the manufacturers come in direct competition with the cheap labor of England, France, Germany, Austria, Italy, etc. The best of machinery is in use in foreign countries, and their output is larger than ours, in proportion to the capital invested, as the workmen abroad work longer hours. Platinum lines are not affected as much, as this metal is used mostly for special order work and from designs where only one piece is made. Metal parts and novelties of brass, tin, aluminum, bronze, etc., are made so cheap abroad that a protective duty is necessary or the manufacturers here will go out of business or reduce wages to make up for the difference in duty.

Riker Bros., manufacturing jewelers, say that if the duty is reduced very much it will have a disastrous effect on their business and if reduced on general lines, so as to affect these industries, then it will also be seriously felt by the jewelry trade. Jones & Woodland, manufacturing jewelers, are in favor of letting well enough alone and that it is very poor policy to go hacking at the manufacturing interests to see how close you can come to them without killing them altogether.

The Alpha Jewel Company say that jewels can not be made in direct competition with Europe.

Carter, Howe & Company, manufacturing jewelers, are opposed to any revision, except by a commission who would look into all phases of the subject.

What applies to metal, also applies to other lines used in connection, such as pearl, ivory, celluloid, amber, tortoise shell, Parisian ivory and all the precious and semi-precious stones. Hayes Bros. say a small reduction would not hurt business, and anyway the trade would not be affected much for two years. Charles Nobs & Sons and the Newark Watch Case Material Company say that it would be impossible to continue manufacturing these lines if the duty was lowered very much.

If the duty is lowered on watches it will hurt considerably the cheaper line of watches, selling from one to ten dollars. It will also affect some of the higher priced watches. A protective duty is also necessary for watch cases. C. Lemaitre &

Company, making findings for the manufacturing jewelers, are very much opposed to any radical reduction in duty on general lines or in their own line, for it is bound to disturb business. The Henry Ziruth Company, making gold and platinum chains, say they hope conditions will not be as bad as under the old Wilson tariff bill, when most every one was looking for a free soup house.—H. S.

PHILADELPHIA, PA.

MAY 5, 1913.

There is much talk of merging the three large trade associations in one strong body, the Board of Trade, Chamber of Commerce and the Merchants and Manufacturers' Association, as well as the 105 smaller organizations.

The John T. Lewis Bros. Company are erecting a one-story manufacturing building, 185 x 265 feet in size, and a three-story wing at Huntingdon street and Aramingo avenue. They expect to put in a plant to melt and cast pig lead.

The Ajax Metal Company are erecting two new buildings, 34 x 240 feet in size, at Orthodox street and Delaware avenue. One will be for storage purposes and the other for smelting plant. The smelting business will be moved from the present plant at Richmond street and Frankford avenue to the new quarters. The old smelting plant will be used for a foundry to double the capacity of the metal alloy castings. M. Ward Easby was the engineer in charge of the construction work.

The Merchant & Evans Company, of this city, have been adding considerable machinery to their plant at 2025 Washington avenue, and will remove their tin plate dipping plant to Glenova, W. Va.

W. R. Ayers, of the Union Can Company, Rome, N. Y., has built a three-story addition to the plant, 50 x 150 feet in size, to be used as a warehouse and for manufacturing purposes.

The Eynon-Evans Manufacturing Company are now occupying the new three-story modern brass foundry recently completed by them and which was fully described in THE METAL INDUSTRY June, 1912.—H. S.

ROME, N. Y.

MAY 5, 1913.

Manufacturers of Rome, N. Y., the great copper and brass manufacturing city, are entertaining feelings of unrest over the proposed tariff changes. This is the prevailing outlook despite the fact that most of the copper received in this city, which amounts to several hundred tons a year, is mined in this country, and, of course, would not be affected in price by any tariff schedules. This feeling has been fostered to a large extent by the fact that for the last four months the mills of the Rome Brass & Copper Company, Bedstead Works, etc., have had a shortage of orders. The Metal Mill, one of the largest plants of the Rome Brass & Copper Company, which employs nearly a thousand men, was hit hardest in this slump of orders, and for the greater part of this time has run five days a week. To make the embarrasing situation more noticeable, this drop was from an exceedingly busy period, when the shop was worked night and day.

Within the last two weeks business has picked up quite a little and all shops in this city are now working five days and a half a week. This shortage of orders, thought to be due to tariff agitation, is what make Rome manufacturers tremble for their pocket-books. That there will be no permanent falling off of business, is the expectation, however, and this is shown by the fact that additions are being built on the Metal Company's great site and also to the Rome Manufacturing Company.

President Johnson of the Rome Manufacturing Company expressed to THE METAL INDUSTRY correspondent his distrust of any tariff changes. This is his position in spite of the fact that copper, the metal most largely used in his factory, cannot be increased in price. Mr. Johnson has under charge now the building of a large addition to the "Teakettle Works," which his factory is called. At present its output consists most largelv of teakettles, washboilers, tea and coffee pots, and all sizes of brass and copper tubes. In the new addition will be placed a complete, mechanical equipment for the manufacture of brazed, steel tubes. It is expected also that the output of teakettles will be largely increased during the months of the coming summer.

Not long ago the Rome Hollow Wire & Tube Company, whose membership includes many of the stockholders of the Rome Brass & Copper Company and other industries, moved from the small factory on E. Dominick street near the Mohawk River to the bigger plant which was left vacant by the Rome Tube Company, when it became incorporated with the Rome Brass & Copper Company and moved its machinery to the big Metal Plant site, where a new factory had been built. This company does a large business in small seamless tubes.

The general manager of the Rome Brass & Copper Company, Mr. Barton Haselton, has been a leader in the formation of a shop baseball league, which has teams from nearly every factory of the city. Its season was started last Saturday. The plan now is to build a base ball diamond wherever it is possible, in connection with every shop represented in the league. This follows the lead of the Metal Mill crowd. Mr. Haselton caused to be built a first-class diamond not far from the outside gate of the metal plant. The greatest enthusiasm is being shown over this project, and games will be played all summer.—J. K.

COLUMBUS, OHIO

MAY 5, 1913.

Despite the bad influence of the recent disastrous floods, the metal trade in Columbus and vicinity has been rather active. Dealers in metals of all kinds say the trade is much more active than they anticipated under the conditions. The tone of the market is satisfactory and the future outlook is promising.

Since most of the plants which were put out of commission by the floods have resumed operation metal brokers are having a nice run of orders for brass, copper and aluminum. There is also a good demand for babbitt. Tin, lead and zinc are also moving well under the circumstances. For scrap brass, No. 1 red, the local dealers are paying from 11¼ to 12 cents, while heavy copper is quoted at 13 to 13½ cents. Casting aluminum is quoted between 18 and 20 cents.

One of the effects of the flood was to place a quietus on the promotion of concerns which would be metal users. Everything has been done towards cleaning up the damage of the flood, and as a result little attention has been given to organizing new companies. But there are several on the way now and it is expected several new metal using concerns will be started soon. The John W. Brown Manufacturing company, manufacturers of automobile lamps, sustained some damage from the flood, but the plant is again in commission.

The Ohio Metal company, located at 502 Kimball street, which was located in the heart of the flooded district, has just about cleaned up after the high waters. Considerable damage was done, but the concern is doing business as usual. The natural gas connections were taken away and coal and coke has been used as fuel.

Topper Bros., junk dealers at Kimball and Mitchell streets, Columbus, which sustained considerable loss from the flood, started business again April 14 at the same location. Henry Loeb, head of the Ohio Metal Company of Columbus said: "The reduction of the tariff on lead and zinc will play havoc with the metal trade. We already see the influence of the proposed bill, which is that of dealers trying to get out from under before it is too late. This makes the market still weaker than it would be otherwise."—J. W. L.

DETROIT, MICH.

MAY 5, 1913.

The new tariff bill that is worrying so many manufacturers throughout the country is giving little concern to Detroit producers. Interviews granted by several of the most prominent here show an entire disregard as to the workings of the measure, so far as it might affect the brass and aluminum industry. Some of the most careful manufacturers admit they gave it little concern after they discovered they were not particularly affected by the bill. W. J. Cluff, of the Frederick B. Stevens Company, declares he can see no way in which this proposed measure can affect the general brass and aluminum business and referred THE METAL INDUSTRY representative to the heads of the big rolling mills in this city who, he said, had made a

more extensive study of the measure than he or any one connected with his establishment.

Charles Sprague, of the Michigan Copper & Brass Rolling Mills, said he could see nothing in the new tariff measure that would in any way affect the brass industry in Detroit, or in any other part of the country. He said it might perhaps cause a variance of a cent a pound or so and it might not, but in a general way there is nothing about the measure to cause alarm or elation. J. H. Murphy, of the Murphy Potter Company, manufacturers of brass and aluminum automobile specialties, also could see nothing in the measure to alarm or elate. Mr. Murphy says even if there should be a change in prices it would have no effect on his concern, due to the fact that most of its work is done under contracts received from all over the United States, and any change in cost of production would be met by a change in contract prices. In consequence, he says, he fails to see where the manufacturer would be affected so far as his profits are concerned. If any one is affected it would be the consumer. Mr. Murphy does not believe that the brass or aluminum business will be affected one way or another, even if the measure goes into effect.

R. H. Mitchell, of the Pemberthy Injector Company, a concern that probably produces as many injectors as any concern in the country, declares the new tariff measure will have no effect on the brass and aluminum industry in Detroit or any other part of the country. Manufacturers, he believes, will hardly realize that a change has been made. He sees nothing to fear or to be elated over, and believes the stability of the trade as now exists will continue the same as it has for some time.

The general condition of the brass and aluminum business in Detroit at the present time was never better. All establishments of this kind in the city are working full handed, and probably will continue to do so indefinitely. All automobile plants, where great quantities of brass and aluminum are used, like the majority of others throughout the country, are operating full handed. Many at present are unable to obtain sufficient help. Mechanics of every kind are in great demand.—F. J. H.

LOUISVILLE, KY.

MAY 5, 1913.

Business is brisk in the metal industry in Kentucky, considering the disturbed conditions of affairs which might be expected to exist owing to the recent occurrence of floods and storms and the prevailing agitation in the trade in metals and alloys, because of the contemplated revision of the tariff under a new political administration. On the whole the copper, brass and other metal markets in this section are firm, exhibiting fair although not unusual activity, and the outlook is for increased business during several months to come, owing to excellent demand anticipated for the services of founders and smiths.

The chief industries of this section supporting the copper trade, including distilling, brewing and canning, should not exhibit any weakness, having been little if any embarrassed by the turbulent condition of traffic and general trade early in April. Busy weeks are ahead for the brass founders and for the manufacturers of plumbing supplies and other metal products consumed during a brisk building period such as that forecast for the summer of 1913. It is expected that the season which is opening will produce even greater building activity than the record-breaking aggregate of last year, totaling $6,500,000. Factory owners, machine shops and other consumers of castings may be expected to produce a thoroughly satisfactory volume of trade, owing to the prosperous conditions now making themselves felt in a majority of lines throughout the Central Ohio valley.

"Sheet copper has declined one cent in price during the past thirty days and is now at 21 cents per pound, owing to a decrease in cost of pig copper," said W. P. Davis, a prominent figure in the metal industry in Louisville. "There is some apprehension exhibited, particularly in the trade further south, on account of the proposed revision of the tariff, and the general disposition seems to be in favor of inaction pending the outcome. However, we may expect good business in this locality as the distillers, figuring as the most important consumers of copper in Kentucky, will commence extensive plant improvements, the erection of new distilleries and so forth as soon as their active operating season closes, and this is now drawing to an end. Traffic in copper is brisk just now in anticipation of the contracts which will be awarded the smiths during July, August and September." Mr. Davis recently returned from a short business trip to Knoxville, Tenn.

"The general opinion in the plumbing supply trade, bearing such importance in brass founding, is that the revision of the tariff which is pending will exert a temporarily bad effect upon business, but the change may certainly not be considered as more serious than any other sudden innovation affecting the entire trade, and we have no reason to believe that future business will be anything but the best," said Theodore E. Mueller, manager of the Louisville plant of the Standard Sanitary Manufacturing Company. "Our factory is running evenly, and prosperous conditions throughout this section of the country should provide a very satisfactory summer."—C. D. C., JR.

PITTSBURGH, PA.

MAY 5, 1913.

The location in the Pittsburgh district of a new industry which is of great importance to the steel manufacturers, galvanizers, tin plate trade, wire mill and oil refining plant officials was announced on April 12 by the Pittsburgh Industrial Development Commission. This company is a subsidiary of the American Metal Company, Ltd., of New York, known as the American Zinc & Chemical Company. This concern is being organized with a Pennsylvania charter to operate the new works. The American Metal Company now has plants in several Western States. N. L. Heinz, formerly of the Matthiessen & Hegeler Zinc Company, La Salle, Ill., one of the best known metallurgical and acid experts in the country, has been named as general manager of the new company. He will take charge at once.

Three hundred and fifty acres of surface land and 2,500 acres of coal land have been taken over by the company at Burgettstown, a few miles from the Pittsburgh city limits, and here the plant will be erected. Construction work has begun. As Burgettstown is four miles from the nearest town of any size, Canonsburg, it will be necessary for the company to erect a model town for the workmen and their families. It is thought that about 500 men will be employed at the beginning, later about 1,500 to be given work there.

The initial investment will be $2,000,000, and it is planned to ultimately spend about $5,000,000. The finished plant will probably be ready in three years; the initial plant this fall. What is known as a unit plant will be erected at once and will have a capacity of producing 40,000 tons of sulphuric acid and 20,000 tons of zinc annually. As the plant is enlarged the capacity will be enlarged also.

The Burgettstown site was taken over only after an exhaustive study of conditions by Mr. Heinz and Dr. Otto Sussman, chief mining engineer of the American Metal Company. This investigation extended over a period of more than eight months. Test holes were drilled on the property to ascertain the quality and quantity of coal, and it was found that there is enough fuel underlying the land to satisfy the requirements of the company for 75 years. The model town to be constructed is a reality, a gardener already having been employed to lay out the site along the lines of most improved town development. First-class cottages of brick and frame construction will be built, each with it own lawn and garden, and everything will be done to look for the comfort and convenience of the workers and their families.

The Bronze Metal Company, of Meadville, Pa., has approved plans by Architect E. A. Philips, of New York, for a new plant, one, two and three-story, hollow tile and steel. The new foundry will have a floor space of 10.750, the pattern shops 30 x 32 feet, and pattern storage 32 x 38 feet. The foundry will be furnished with tramways and modern handling equipment, with electric drive throughout.

Much credit for locating the company in this district is due to R. W. Cook, industrial agent of the Pennsylvania Lines west of Pittsburgh. Appreciating the advantages of this district for a company of this kind, he worked incessantly with the officials of the company to show them the feasibility of taking the Pittsburgh district property. The location of the works is also appreciated by the many steel manufacturers and oil refiners of the district, as it insures them an ample supply of high-grade acid.—N. B.

NEWS OF THE METAL INDUSTRY GATHERED FROM SCATTERED SOURCES

The Simplex Brush Company, makers of all kinds of hand and machine brushes, Cleveland, O., has been sold to Herald Brothers Company, 62 Public building, Cleveland, O.

The Bridgeport Brass Company, Bridgeport, Conn., is to erect an addition to its factory on Housatonic avenue, to be 70 x 43 feet, between City Yard and Grand street.

The Ideal Furnace Company, Chester, Pa., has just issued a new catalog, describing the "Ideal" metal melting furnace in detail, showing tests, cost of operation, etc. Copy sent on application.

The Riehl Manufacturing Company, Cleveland, O., who have been manufacturing a full line of brushes for the use of founders and platers, have sold out their business to the Osborn Manufacturing Company, Cleveland, O.

The Tolhurst Machine Company, Troy, N. Y., have lately installed their Centrifugal Dryer systems at the plants of the Ingersoll Watch Company, Trenton, N. J., and the National Cash Register Company, Dayton, Ohio.

The National Brass Company, Grand Rapids, Mich., are building a factory at the present time on Madison avenue, which will be 64 x 80 feet. They also operate another plant 60 x 100 feet which has been leased for three years.

The Apothecaries Hall Company, 18 Benedict street, Waterbury, Conn., are now manufacturing their own anodes of nickel, brass, copper and zinc. It is the policy of this company to guarantee the quality of all their products and anodes are no exception to this rule, the percentage of purity is fully guaranteed.

The International Electric Smelter & Machine Company, 11 Cliff street, New York, design, license and operate an electrolytic smelter for aluminum ore, etc., electric weighing and labor-saving machines, electro-chemical protection for banks, etc., and also act as fuel, machine and labor efficiency engineers.

The Titanium Alloy Manufacturing Company announces that the sale of its products will hereafter be in charge of the general manager, Andrew Thompson, with offices at Niagara Falls, N. Y., and that A. C. Hawley will represent the company in the Pittsburgh district, being located at the company's office in the Oliver Building, Pittsburgh, Pa.

The Merchants' Association of New York has moved into its new headquarters in the Woolworth Building, 233 Broadway, its old quarters at 54-60 Lafayette street having been outgrown. The new headquarters occupy the greater part of the ninth floor of the Woolworth Building, and they afford ample accommodations for the many activities of the association.

The United States Aluminum Company, at Arnold, Pa., has been granted permission to erect a large plant in that city. The town council agreed to vacate twelve streets of the town in order to allow for the establishment of the plant. The company gave a bond of $10,000 that it would erect a plant at a cost of $50,000, to be installed within three years. The ground occupied comprises thirty acres.

V. Henning & Sons, metals, of Brooklyn, N. Y., through George Henning announce that they have just added four more city lots to their plant in addition to the three which they added last September, so that now the firm has a total space covering twenty-one city lots. This firm makes a specialty of metal clippings of all kinds and supply solders, babbitt metals and metals for foundry use.

The Canadian Rogers Company, Toronto, Can., manufacturers of silverware, of whom S. J. Moore is president, has just concluded a deal whereby they will acquire the business of the Toronto Silver Plate Company. As the business of the Toronto Silver Plate Company has been taken over as of January 21 of this year the new Rogers company will go into earnings from commencement.

C. Wadsworth, of 961 Woodward avenue, Detroit, Mich., announces that he has established an office at the above address with the intention of representing manufacturers of contractors' machinery and materials of construction, making more or less a specialty of municipal equipment and supplies. He is also prepared to render whatever engineering service may be necessary to insure the proper installation and operation of the apparatus which he sells.

The Colonial Brass Company, Middleboro, Mass., will be ready for business on May 1, and will consist of a modern up-to-date brass foundry, a thoroughly equipped machine shop and a first-class plating plant. The object of the concern is to carry on a very similar business to that of the Murdock Parlor Grate, making a strong line of fire-place accessories, bronze memorial tablets, bronze name plates and bronze sun-dials; also bronze and aluminum castings.

The Hachmeister-Lind Chemical Company, of Pittsburgh, Pa., are making a special offer to the plating trade in general on their German Chinisol for nickel-plating, by shipping out a regular sample package on approval, and they claim if it does not do all that is claimed for this material it may be returned at their expense. They state that all "Halico" Brand chemicals are sent subject to approval, simply to assure their friends of the merit of these materials and of their faith in them.

J. Svirsky is making arrangements for the establishing of a large refining plant at Watertown, N. Y., to refine brass and copper waste on a large scale. Mr. Svirsky has purchased great heaps of metal waste at the plant of the New York Air Brake Company, which he estimates contains about 10,000 pounds of metal. He also has contracts with other concerns, including the Westinghouse Air Brake Company, Wilmerding, Pa., and the Rome Brass & Iron Company, Rome, N. Y.

The Indiana Electric Company, Traction-Terminal Building, recently incorporated, will build a factory and warehouse at 1022 East Michigan street, Indianapolis, Ind. It has taken over from the Indianapolis Brass Company more than 1,000 devices, relating to electric railway equipment, assuming the patents, contracts and unfilled orders of the brass company. The latter will continue in the jobbing brass trade and making of aluminum castings. James H. Drew, who was one of the organizers of the brass company, is general manager of the new company.

It is reported that a plant for the manufacture of silver plated ware known as Sheffield ware will be established in Washington, D. C. The plant, which, it is expected, will be removed to Washington, is now located at Salamonca, N. Y., and will be what is known as a smokeless factory and will employ about a hundred men. About 10,000 square feet of floor space will be required. A sub-committee of the Washington Chamber of Commerce, composed of three members, is now at work getting a complete report as to the advisability of the move.

The Cowles Aluminum Company, Lockport, N. Y., recently won its patent suit against the Carborundum Company, of Niagara Falls, N. Y. The litigation between the two concerns has covered a period of eleven years, several patents being involved. Under the final decree of the United States Circuit Court of Appeals in the third circuit, the Cowles company is awarded a judgment for $104,505.24. The court holds that for the period between January 1, 1901, and June 9, 1908, the date of the expiration of the Cowles patent, the Carborundum company was infringing, and judgment of profits was awarded covering this period.

The firm of Chas. F. L'Hommedieu & Sons Company, of Chicago, whose business has been growing so fast for the past few years, have decided that it is necessary for them to have much larger quarters, as they say their trade has more than doubled in the past two years. They have, therefore, purchased ground for a factory and office at Ogden and Forty-fifth avenues, and will soon have all plans made, and work will begin in the early fall on a new building to have a ground floor space of some 14,000 square feet. The building at the present will be only one story, but will have a high basement under the whole, making it practically two stories. The C. B. & Q. R. R. tracks will have a switch in their property.

FOREIGN BUSINESS OPPORTUNITIES

No. 10794. Semimanufactured Metals and Cotton Piece Goods.—An American consul reports that a foreign business house doing an export business with British India would like to cooperate with American manufacturers of metal of a semimanufactured nature, such as bar and sheets, plain and galvanized, also with manufacturers of cotton piece goods, for placing their goods on the markets of British India, and would like to correspond with American firms doing business in such lines that might desire to cater for this trade.

(In applying for addresses at Bureau of Foreign and Domestic Commerce, Washington, D. C., refer to file number.)

BETHLEHEM STEEL COMPANY OFFICERS

Formal announcement of recent changes in its organization, some of which have already been published, is made by the Bethlehem Steel Company, South Bethlehem, Pa. The official personnel is now as follows: C. M. Schwab, chairman of the board; E. G. Grace, president; A. Johnston, H. S. Snyder and C. A. Buck, vice-presidents; B. H. Jones, secretary and treasurer; F. A. Shick, auditor; A. D. Mixsell, general sales agent; G. H. Blakeley, manager structural steel sales and structural engineer; W. M. Tobias, purchasing agent; W. F. Roberts, general superintendent Lehigh plant; R. F. Randolph, general superintendent Saucon plant; R. P. Stout, engineer of ordnance; J. H. Ward, secretary to chairman; J. D. Hagenbuch, assistant to president; James Kernan, assistant secretary and assistant treasurer; T. O. Cole, traffic manager.

CONSERVATION AT THE BROOKLYN NAVY YARD

The U. S. Navy Yard, Brooklyn, N. Y., has recently put into commission a new plan for disposing of its waste material from the brass and bronze casting shop. This plan, which is a scheme evolved by Pay Inspector and General Storekeeper E. D. Ryan, consists practically in the reclaiming of the metal from the ashes, sweepings and other refuse as far as possible by various well-known methods and then turning the final residue over to a smelter who enters into a contract before he takes the goods from the Navy Yard, whereby the smelter agrees to return a minimum amount of metal from the residue. By this method the Navy Yard knows before the material is given out just exactly how much it may expect to get for the material as a minimum, and should the material yield more than the amount specified in the contract the Navy Yard gets the benefit of this amount also. It is estimated by Mr. Ryan that the first contract entered into by the Navy Yard showed a saving of at least $10,000 over previous methods employed in the yard for taking care of such material. The metal reclaimed from the refuse is returned to the Navy Yard in the form of virgin metal, such as copper, tin, zinc, lead, etc., and this metal is then used over again as new metal for casting the various bronze and brass pieces made in the yard.

GOVERNMENT WANTS

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., May 20, 1913, and publicly opened immediately thereafter, to furnish at the navy yard, Norfolk, Va., etc., a quantity of naval supplies, as follows: Sch. 5385: Boring, drilling and tapping machine, double surface machine.—Sch. 5396: Pump leather.—Sch. 5399: Sheet tin.—Sch. 5400: Cypress, redwood.—Sch. 5401: Flexible copper hose.

To furnish at the navy yard, Washington, D. C., etc., a quantity of naval supplies, as follows: Sch. 5394: Ingot tin.—Sch. 5395: Microscopical outfits.—Sch. 5401: Naval brass.

To furnish at the naval torpedo station, Newport, R. I., a quantity of naval supplies, as follows: Sch. 5384: Motor driven punch press.—Sch. 5392: Hard-drawn bronze.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., May 27, 1913, and publicly opened immediately thereafter, to furnish at the navy yard, Puget Sound, Wash., a quantity of naval supplies, as follows: Sch. 5404: Pig tin.—Sch. 5406: Cumberland coal, and to furnish at the navy yard, Mare Island, Cal., etc., a quantity of naval supplies, as follows: Sch. 5403: Acetylene generator, etc.—Sch. 5405: Rod and sheet brass, bronze, bar copper, monel metal, chloride of calcium.

Applications for proposals should designate the schedules desired by number. Blank proposals will be furnished upon application to the navy pay office, Seattle, Wash., or to the Bureau. T. J. Cowie, Paymaster General, U. S. N.

REMOVALS

YALE & TOWNE NEW BUILDING

The Yale & Towne Manufacturing Company announces the removal of its general offices from 9 Murray street to

YALE & TOWNE NEW BUILDING.

9 East Fortieth street, New York, on April 18, 1913. The site comprises a plot 50 x 100 feet, occupied by a twelve-story

building, as shown in cut, erected and owned by the company and carefully designed to meet their requirements. The entire ground floor is devoted to a series of exhibit rooms, which, when completed (about July 1), will comprise the largest and most effective display of locks and builders' hardware which has ever been made, and which are designed to serve the convenience of architects and their clients, and of trade customers generally.

The Watson-Stillman Company has moved its Chicago office from 449, The Rookery, to the McCormick Building, Chicago, Ill.

The John J. Jackson Company, one of the oldest rolled silver manufacturers in Newark, will move shortly to the new factory at 156 and 158 Astor street, which was designed by Trauschold & Dowden. The new building is two stories and measures 50 x 90 feet, being constructed of red and white brick, with reinforced concrete floor in the second story.

The E. B. Van Wagner Manufacturing Company, Syracuse, N. Y., makers of finished die cast parts and bearings, have removed their general offices to the factory at Fayetteville, N. Y., just outside of Syracuse. Extensive improvements have been made to the factory buildings, increasing office and manufacturing facilities. A Syracuse office is still maintained by the company in the Union Building, but all business is transacted from the main offices at the factory. H. L. Babcock, formerly of the H. H. Franklin Manufacturing Company, is now representing the Van Wagner concern in the middle West.

RECEIVERSHIP

The Rockwell Furnace Company, 26 Cortlandt street, New York City, has failed, and its affairs have been placed in the hands of Receiver William Blau, with offices at 141 Broadway. From all the information obtainable the offices and works of the company will be closed and the concern will go out of business. The officers of the company were, at date of June, 1912: F. S. Garrett, president; Geo. A. Berger, treasurer; L. D. Rockwell, secretary, and its business was the design and manufacture of all kinds of melting and annealing furnaces.

The Rockwell Furnace Company should not be confounded with the W. S. Rockwell Company, of 50 Church street, New York City, which is engaged in a similar business, but whose officers are W. S. Rockwell, president; Jos. A. Doyle, vice-president; E. S. Long, secretary and treasurer; Geo. A. Yagle, assistant secretary and treasurer. This company is operating under Rockwell patents. It was originally the Rockwell Engineering Company, from which there were formed several new corporations by different individuals, but there is now left only one company bearing the Rockwell name, viz.: The W. S. Rockwell Company, which is operated by the original founder of the business.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators. Particulars of additional incorporations may frequently be found in the "Trade News" columns.

The Paramount Brass and Manufacturing Company, of Cleveland, Ohio, has been incorporated with a capital stock of $10,000 to manufacture brass goods and generally dealing in the same. The incorporators are William H. Dehn, William C. Crimmel, Clara Dehn, Alma R. Crimmel and James C. Crimmel.

The National Company, Waterbury, Conn. Capital, $50,000. To manufacture iron and brass specialties. Incorporators: M. J. Byrne, F. C. Smith and Arthur A. Tanner. The company has purchased a tract of land in Waterbury with a railroad running through it, containing between 9 and 10 acres, and has a plan being prepared for a factory building which they expect to construct immediately.

The National Brass Company, Ltd., London, Ontario. Capital stock, $40,000. To manufacture plumbers' brass goods and supplies. Directors: John F. Grant and Charles H. Ivey, both of London.

The Union Specialty & Plating Company, Cleveland, Ohio. Capital, $20,000. To manufacture electric plating apparatus, appliances, supplies and specialties. Incorporators: W. J. McNamara, W. L. Brown, E. B. McNulty, Erwin G. Guthery and B. J. Guthery.

PRINTED MATTER

Furnaces.—The W. S. Rockwell Company, 50 Church street, New York City, have recently issued catalog No. 17 describing their Rockwell annealing, case-hardening, hardening, tempering and heat treating furnace of the stationary type.

Dust Collecting System.—The Cleveland Blow Pipe & Manufacturing Company, Cleveland, Ohio, give a complete description of their dust collecting system, exhaust fans and adjustable hoods to be used on buffing and polishing emery and grinding wheels, in a compact little booklet just issued, copies of which can be obtained upon request.

Mechanical Data: Popular Mechanics, book department, Chicago, have issued a number of circulars giving descriptions of their books relating to mechanical science. Included in the list are Metal Work and Etching, Metal Spinning, Electroplating, Mechanical Drawing, Shop Notes, consisting of a set of eight volumes and Arts Crafts Lamps. Books of every description are published by this company and catalogs may be had upon application.

Vanalium.—The Standard Alloys, Ltd., Stratford, London, have issued a twenty page catalog giving full descriptions and photographs of their new product Vanalium, which is termed the new light engineering metal, manufactured by Ivanson's process. Vanalium is a very interesting alloy of aluminum, having a specific gravity of 2.75 against that of brass at 8.54 and copper 8.82. Further information is available by addressing the above firm for copies of the catalog.

Brass Goods.—The Haydenville Company, Haydenville, Mass., have issued Catalog D, descriptive of the high-grade plumbing goods which they manufacture. The catalog consists of one hundred and twenty pages and is fully illustrated by means of half-tone cuts of all of the extensive line of plumbers' goods which the company make. These cuts include the "Hampshire" Red Metal Compression Work, plain and hose bibbs; German pattern basin cocks, double bath cocks, "Quik-Ope" quarter turn action, plain and hose bibbs, safe closing work and the Haydenville Improved Fuller Work. Copies of this catalog will be sent upon request for Catalog D.

CATALOG EXHIBIT

An exhibition of every kind of catalog may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogs, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

METAL MARKET REVIEW

NEW YORK, May 5, 1913.

COPPER.

The copper market during the month of April has shown a fairly steady advancing tendency against all sorts of unfavorable developments both here and in Europe. Today the speculative London market is much firmer in the news that peace in the Balkan States is just about assured and the market in London advanced nearly £1 per ton, this making an advance of about £3 in the last two weeks. The home market has been dull and active in spots, following more or less the sentiment of the foreign market.

There has been a fair business done during the month with domestic consumers at prices ranging from close to 15¼ at the opening to 15⅝ today. The larger producers have all been holding for 15¾ cents for the last week or so, but there have been sales by dealers and outside interests at from 15 to 25 points below the producers' prices. These lower prices were made for future deliveries, like May and June, while the spot market has been held fairly steady. Today there seems to be an actual scarcity of spot and May electrolytic, while dealers will sell June and July at 10 to 15 points below producers' prices.

The exports for the month have been quite heavy, 33,024 tons or nearly 74 million pounds, making a total so far this year of 285,084,800 pounds against 252,644,120 pounds for the same period last year, an increase of over 22 million pounds.

This does not look as though the war had actually interfered very much with the consumption abroad, especially when the European stocks of copper have decreased from 34,000,000 pounds a year ago to 98,000,000 pounds at the end of April.

Lake Copper is quotable today at 15¾ cents, Electrolytic 15⅝ to 15¾ cents, casting brands 15½ cents.

TIN.

Of course during the month of April, as usual, the unexpected happened. We had a short supply and very little tin coming along that naturally meant a "corner" and a big premium for April tin. There was no question about it—we use so much tin and we shall only have so little—it was so simple. As a matter of fact we did have "so much" tin here that it was selling at ½-cent a pound below the cost of import. Today the price here is still below cost. Spot tin is quoted at around 50 cents and futures a shade under.

If you are interested in figures (they are terrible liars) the visible supply of tin is about 2,000 tons less than a month ago; that, of course, means over 50 cents for tin—possibly 52 cents—so, of course, consumers will know what to do. It looks too easy; it seems a shame to take the money.

LEAD.

The lead market was jogging along very innocently in April at around 4.30 to 4.35 when the Trust jumped it 15 points to 4.50 New York basis on April 22. Of course the independents did not mind that, and it did not matter a continental about consumers; that's what they were there for. Three dollars a ton because one man said so! Well, it is presumed this all-wise Trust filled up all the consumers they possibly could and then today, May 5, they dropped the price 15 points back to the 4.35 basis. How is that for a raw deal—excuse the slang, but the whole transaction looks very like robbery.

That's the market today—4.35 New York and about 4.20 East St. Louis.

SPELTER.

The spelter market declined from 6 cents at the opening to close to 5½ New York and at the close is rather steadier at about 5.60 New York and 5.40 East St. Louis. Sheet zinc has been reduced to 7.75 f. o. b. Mill.

ALUMINUM.

The market is rather easier and prices here have declined nearly ½ cent per pound. Domestic is quoted at around 26½ cents, while cost to import is about 26¾ cents. The foreign market is reported firm.

ANTIMONY.

There has been very little change in antimony. Cooksons is quoted at 8.90 against 9 cents a month ago, with Halletts at 8¼ and Hungarian grade at around 7¾ cents.

SILVER.

The silver market for the month shows a net advance of about 3 cents in New York to 60⅝ cents at the close and 28d. in London.

QUICKSILVER.

The wholesale price is held at $39 per flask, while for jobbing lots the price is $40 to $41 per flask.

PLATINUM.

There has been no change in the platinum market. Hard is quoted at $51 per ounce with ordinary refined at $46.

SHEET METAL.

Sheet copper has held fairly steady at around 21 cents base; copper wire is quoted at 16¾ to 17 cents; high sheet brass unchanged at 15⅜ cents.

OLD METALS.

Market is rather more active and the higher turn to the London copper market has helped to strengthen all copper scrap here. There is a little business doing with a fair demand from Europe.—J. J. A.

APRIL MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	15.75	15.20	15.60
Electrolytic	15.75	15.20	15.55
Casting	15.50	15.00	14.35
TIN	50.25	47.65	49.25
LEAD	4.50	4.35	4.45
SPELTER	6.10	5.55	5.80
ANTIMONY (Hallett's)	8.50	8.25	8.40
SILVER	60⅞	57⅜	59.50

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		May 8, 1913.
Stocks of marketable copper of all kinds on hand at all points in the United States, April 1, 1913		104,269,270
Production of marketable copper in the United States from all domestic and foreign sources during April, 1913		135,333,402
		239,602,672
Deliveries:		
For domestic consumption	78,158,837	
For export	85,894,727	
		164,053,564
Stocks of marketable copper of all kinds on hand at all points in the United States, May 1, 1913		75,549,108
Stocks decreased during the month of April		28,720,162

WATERBURY AVERAGE

The average price of Lake Copper per pound as determined monthly at Waterbury, Conn.

1912—Average for year, 16.70. 1913—January, 17; February, 15.50; March, 15⅛. April, 15.75.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the rear advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds, assists in the buying and selling of metals, machinery, foundry and platers' supplies, procures positions and secures capable assistants. See Want Ad pages.

Metal Prices, May 12, 1913

METAL PRICES.

	Price per lb. Cents.
COPPER—PIG AND INGOT AND OLD COPPER. Duty Free. Manufactured 2½c. per lb.	
Lake, carload lots	15.75
Electrolytic, carload lots	15.75
Casting, carload lots	15.60
TIN—Duty Free.	
Straits of Malacca, carload lots	50.00
LEAD—Duty Pig, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.35
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western, carload lots	5.65
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars, and rods, 11c. per lb.	
Small lots, f. o. b. factory	25.20
100 lb. lots, f. o. b. factory	23.20
Ton lots, f. o. b. factory	26.50
ANTIMONY—Duty 1½c. per lb.	
Cookson's cask lots, nominal	9.00
Hallett's cask lots	8.25
Hungarian grade	7.85
NICKEL—Duty Ingot, 6c. per lb. Sheet, strip and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots. Blocks according to quantity	40 to .45
ELECTROLYTIC—3 cents per pound extra.	
MANGANESE METAL—Duty 20 per cent	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	$1.50
BISMUTH—Duty free	$2.00
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad valorem	.98
QUICKSILVER—Duty 7c. per lb	.56
	Price per oz.
GOLD—Duty free	$20.67
PLATINUM—Duty free	46.00
SILVER—Government Assay Bars—Duty free	.60⅝

INGOT METALS.

	Price per lb. Cents.
Silicon Copper, 10% ..... according to quantity	27 to 32
Silicon Copper, 20% ..... " "	34 to 36
Silicon Copper, 30% guaranteed " "	36 to 38
Phosphor Copper, guaranteed 10% ..... " "	23 to 27
Phosphor Copper, guaranteed 15% ..... " "	22 to 26
Manganese Copper, 25% ..... " "	27 to 30
Phosphor Tin, guaranteed 5% " "	60 to 63
Phosphor Tin, no guarantee.. " "	56 to 63
Brass Ingot, Yellow ..... " "	10⅝ to 11⅛
Brass Ingot, Red ..... " "	15¼ to 17¼
Bronze Ingot ..... " "	14½ to 14¾
Manganese Bronze ..... " "	18½ to 20
Phosphor Bronze ..... " "	13 to 16
Casting Aluminum Alloys.... " "	25 to 27
PHOSPHORUS—Duty 18c. per lb. According to quantity	30 to 35

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
13.75 to 14.00	Heavy Cut Copper	15.00 to 15.25
13.50 to 13.75	Copper Wire	14.25 to 14.50
12.00 to 12.25	Light Copper	13.25 to 13.50
12.00 to 12.25	Heavy Mach. Comp	13.75 to 14.00
8.50 to 8.75	Heavy Brass	9.00 to 9.25
7.00 to 7.25	Light Brass	8.25 to 8.50
8.00 to 8.25	No. 1 Yellow Brass Turnings	9.75 to 10.00
11.00 to 11.50	No. 1 Comp. Turnings	11.50 to 12.50
3.75 to ——	Heavy Lead	—— to 4.25
5.50 to ——	Zinc Scrap	4.50 to 5.50
10.00 to 12.00	Scrap Aluminum Turnings	12.00 to 14.00
15.00 to 19.00	Scrap Aluminum, cast, alloyed	17.00 to 20.00
20.00 to 22.00	Scrap Aluminum, sheet (new)	21.00 to 22.00
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

PRICES OF SHEET COPPER.

BASE PRICE, 21 Cents per Lb. Net.

Width.	LENGTH.	64 oz. and over.	32 oz. to 64 oz.	24 oz. up to 32 oz.	16 oz. up to 24 oz.	15 oz.	14 oz.	13 oz.	12 oz.	11 oz.
		Extras in Cents per Pound for Sizes and Weights Other than Base.								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	½	1	1½	2	2½
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	½	1	2	3	4½
	Longer than 96 inches. Not longer than 120 ins.	"	"	½	1	2	3	5	7	
	Longer than 120 ins.	"	"	1	1½					
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	Base	Base	1	2	3	4	6
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	2	4	6	8
	Longer than 96 inches. Not longer than 120 inches.	"	"	1	2	3	4			
	Longer than 120 inches.	"	1	2	3					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	Base	1	2	3	4	6	8	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	4	5	7	9	
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	6	9			
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	5	7	9	11	
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	7	10			
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins., but not wider than 120 ins.	Not longer than 120 ins.	4	6							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, 8 IN. DIAMETER AND LARGER, SEGMENTS AND PATTERN SHEETS, advance per pound over prices of Sheet Copper required to cut them from ..... 3c.

CIRCLES LESS THAN 8 IN. DIAMETER, advance per pound over prices of Sheet Copper required to cut them from ..... 5c.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot and heavier, advance per pound over foregoing prices ..... 1c.

COLD OR HARD ROLLED COPPER, lighter than 14 oz. per square foot, advance per pound over foregoing prices ..... 2c.

COLD ROLLED ANNEALED COPPER, the same price as Cold Rolled Copper.

ALL POLISHED COPPER, 20 in. wide and under, advance per square foot over the price of Cold Rolled Copper ..... 1c.

ALL POLISHED COPPER, over 20 in. wide, advance per square foot over the price of Cold Rolled Copper ..... 2c.

For Polishing both sides, double the above price.

The Polishing extra for Circles and Segments to be charged on the full size of the sheet from which they are cut.

COLD ROLLED COPPER, prepared suitable for polishing, same prices and extras as Polished Copper.

ALL PLANISHED COPPER, advance per square foot over the prices for Polished Copper ..... 1c.

ZINC—Duty, sheet, 1⅝c. per lb.

	Cents per lb.
Carload lots, standard sizes and gauges, at mill	7.75 less 8%
Casks, jobbers' prices	8½
Open casks, jobbers' prices	9

Metal Prices, May 12, 1913

PRICES ON BRASS MATERIAL—MILL SHIPMENTS.

In effect May 1st, 1913, and until further notice.

To customers who buy over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.15⅝	$0.17½	$0.18¾
Wire	.15½	.17¼	.18¾
Rod	.15½	.18	.19¾
Brazed tubing	.19⅝	—	.23½
Open seam tubing	.18¾	—	.21½
Angles and channels, plain	.19⅛	—	.22

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " "
Wire —Extra spring and brazing wire	½c.	" " "
" —Best spring and brazing wire	1c.	" " "

To customers who buy 5,000 lbs. or less per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.16⅝	$0.18½	$0.20
Wire	.16⅜	.18½	.20
Rod	.16⅜	.19¼	.21
Brazed tubing	.21⅛	—	.24¾
Open seam tubing	.20	—	.22¾
Angles and channels, plain	.20⅝	—	.23¼

Net extras as shown in American Brass Manufacturers' Price List No. 9.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " "
Wire —Extra spring and brazing wire	½c.	" " "
" —Best spring and brazing wire	1c.	" " "

BARE COPPER WIRE—CARLOAD LOTS.

17c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	21½c.	per lb. base
100 lbs. to 300 lbs. in one order	22c.	" " "
Less than 100 lbs. in one order	23½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ O. D. Nos. 4 to 13 Stubs' Gauge, 20c. per lb.
Seamless Copper Tubing, 23c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	27	22	21	20	20	20	20	20	20	20	21	22	24	26	27

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 50 and 5%.

PRICE FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Red	18c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	15½c.	" "
" " " Rectangular sheets other than Sheathing	18c.	" "
" " " Rod	15½c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 25¼c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 28 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Gauge.	Width. Inches.	1 ton.	500 lbs.	50 lbs.	Less than 50 lbs.
20 and heavier	3-30	33c.	34c.	36c.	38c.
	3-30	34c.	35c.	37c.	39c.
21 to 24 inclusive	30-48	36c.	37c.	39c.	41c.
	48-60	39c.	40c.	42c.	44c.
25 and 26	3-30	35c.	36c.	38c.	40c.
	30-48	37c.	38c.	40c.	42c.
27	3-30	36c.	37c.	39c.	41c.
	30-48	39c.	40c.	42c.	44c.
28	3-30	37c.	38c.	40c.	42c.
	30-48	40c.	41c.	43c.	45c.
29	3-30	38c.	39c.	41c.	43c.
	30-48	42c.	43c.	45c.	47c.
30	3-30	39c.	40c.	42c.	44c.

The above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. Charges made for boxing. F. O. B. Mill.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.

Outside Diameters. BASE PRICE, 24 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1⅝ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	26	23	..	..	13	19	9	8	15	22
12.	.109.	..	..	..	..	..	..	..	25	..	..	..	14	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	16	..	..	..	..	..
16.	.065.	..	..	..	..	..	27	26	26	23	22	20	20	20	20	26	30	50
18.	.049.	..	..	..	..	32	29	28	27	24	25	25	25	..	..	..	..	..
20.	.035.	116	..	45	38	33	32	31	29	28	29	29	29	30	37	48	57	80
21.	.032.	..	..	..	39	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	137	97	47	41	37	36	34	33	..	..	44	..	..	..	..	..	..
24.	.022.	187	132	107	87	78	72	61	59	65	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price per lb.	33	33½	33½	34	34½	35	35½	36	37	38	39	44	47

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4	per cent.	to No.	19,	B. & S.	Gauge,	inclusive	$0.60
6	"	"	19,	"	"	"	.70
9	"	"	19,	"	"	"	.85
12	"	"	19,	"	"	"	1.00
15	"	"	19,	"	"	"	1.15
16	"	"	19,	"	"	"	1.20
18	"	"	19,	"	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2½c. to 3½c. above the price of bullion.